THE DOCK & HARBOUR AUTHORITY

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Editorial Comments.

THE PORT OF BOMBAY.

We have taken as the subject of this month's supplement the Port of Bombay showing the Alexandra Dock and also a New Bunder which was completed about three years ago.

Bombay Harbour, one of the finest in the world, has about 14 miles by about 5 miles available for shipping. It has very extensive dock and quay accommodation, and to-day is the chief Indian port for foreign trade. The foundation stone for the Alexandra Dock was laid by our present King (then H.R.H. the Prince of Wales) in 1905.

With the acquisition of the Tank Bunder, Bombay now possesses quays to a combined length of about 10,000 yards, which provides accommodation for the many and varied imports, one of which is coal from South Africa or Calcutta.

MACKAY HARBOUR BOARD.

The report of this board for the year ended December 31st, 1927, shows: Total Revenue, £13,639 14s. 7d., of which sum £13,114 13s. 3d. was collected for harbour dues. The receipts for harbour dues were slightly less than the collections for 1926. During the year the work of building up the north wall for a length of 500 ft. from the outer end was completed.

VIZAGAPATAM HARBOUR.

Mr. W. C. Ash, at present Engineer-in-Charge of the construction of King George's Dock, Calcutta, is to be transferred to the position of Engineer-in-Chief of Vizagapatam Harbour, which has become vacant through the resignation of Colonel H. Cartwright-Reid. This arrangement has been made between the Railway Board and the Calcutta Port Commissioners. The transfer is for a period of three years, when it is considered the new harbour will be ready for use. The Calcutta Port Commissioners before commencing the work on King George's Dock sought Col. Cartwright-Reid's advice on questions of lay-out and other matters, and Mr. Ash has since been engaged in carrying out these schemes, and he will still act in a consultative capacity in connection with King George's Dock after his transfer to Vizagapatam.

CO-OPERATIVE GRAIN ELEVATOR CONSTRUCTION IN WESTERN CANADA.

With the ultimate object of locating a grain elevator wherever there are enough pool members to warrant its construction, the Canadian Wheat Pools are adding to their co-operative grain-handling facilities at the rate of 150,000 bushels of storage capacity a day. The three Wheat Pools of Manitoba, Saskatchewan and Alberta are now operating 942 country elevators with a total storage capacity of more than 30,000,000 bushels of grain and 10 terminal elevators with a total storage capacity of 23,000,000 bushels.

In connection with the programme of expansion, the Manitoba Wheat Pool is building over 80 new country elevators which will be ready in time to handle the 1928 crop, the Saskatchewan Wheat Pool more than 125 country elevators and the Alberta Wheat Pool about a hundred. Spectacular features of the extension programme are the construction of new pool terminals at Port Arthur, Ontario, and Vancouver, British Columbia. The Saskatchewan Wheat Pool is erecting a new Port Arthur terminal elevator which is destined to be the most modern and fastest operating in North America, with a storage capacity of 6,900,000 bushels. The new Alberta Wheat Pool terminal at Vancouver, now under construction, will have a capacity of 2,400,000 bushels, giving the Alberta Pool terminal facilities there of 4,050,000 bushels, and which with the Prince Rupert elevator under lease from the Dominion Government will give the Pool a terminal capacity of 5,300,000 bushels on the Pacific Coast.

NEW TEES CROSSING.

It is proposed to hold a conference between the Ministry of Transport, the Durham County Council, and the Middlesborough Corporation, with a view to considering the question of another crossing for the Tees by a bridge or tunnel.

SWANSEA SOUTH DOCK.

The Great Western Railway Company has announced that it will not take any further coal shipments at the South Dock, Swansea, as the appliances at the other docks are fully adequate to meet the present requirements.

CORK DUES OBJECTION

Five shipping companies engaged in the Transatlantic passenger services calling at Cobh, Queenstown, are taking combined action against the proposal by the Cork Harbour Board to increase dues. One of the grounds on which the Harbour Board bases its application is to provide funds for improvements at the entrance to the harbour. On behalf of the companies it is stated that the shipping companies had never heard of such improvements having been proposed. Details of cost are asked for and the date at which it is suggested work would be completed. The Ministry of Industry and Commerce has empowered the Rates Advisory Committee, at Dublin, to hear evidenec on the proposal, and a public sitting is to be held for that purpose.

CONSTANTZA.—TENDERS INVITED.

The Acting British Vice-Consul at Constantza (Mr. A. J. Dowdeswell) reports that the Constantza Port Authorities are inviting tenders for one tug boat and one pilot boat.

Tenders must reach Constantza by the 25th September, 1928.

Local representation is in practice essential.

Firms in a position to offer British-built vessels can obtain further particulars on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference A.X. 6618).

NEW YORK HARBOUR TRAFFIC.

The Merchants Association is to ask Congress at its next session to establish the office of captain of the Port of New York, with powers of traffic regulation in the harbour analogous to those possessed by the Police Department in handling traffic upon the highways. The decision of the board of directors of the Merchants Association to seek such legislation is the result of a study which has been made by its committee on harbours, docks and terminals. The proposal is also approved by the Chamber of Commerce of the State of New York, the Pilots Association and other Maritime bodies.

At present there is a supervisor of the harbour, created under the provisions of a law enacted in 1888. This official is an officer of the United States Navy and is charged particularly with the duty of preventing obstruction or injurious deposits within the harbour and adjoining waters.

There is also an executive in the coastguard, known as the captain of the Port of New York and vicinity, but his bureau is occupied largely with the enforcement of the prohibition law and various customs regulations.

The committee recommending the present proposal is of the opinion that there should be an executive with the powers of harbour traffic regulation, and says that similar executives in foreign ports are of great aid to commerce.

Bills were introduced at the last session by Senator Wagner and Representative La Guordia creating the office of captain of the port and charging him with enforcing such rules and regulations as might promulgated by the proper federal authority. The bills provided that a commissioned officer of the coastguard should be assigned to this duty, with the rank of rear-admiral.

Notes of the Month.

NORTH GERMAN LLOYD TO ESTABLISH CANADIAN SERVICE.

According to the "Ottawa Journal," the North German Lloyd Steamship Company will shortly operate a direct line of steamships from Hamburg and Bremen to Canadian ports. Five boats of about 10,000 tons each will operate to Montreal in summer and Halifax in winter, and are expected to carry large numbers of German settlers to the Dominion.

CANADIAN WHEAT POOL ELEVATORS.

Wheat Pool elevators in Alberta are now being operated on a cost basis to patrons. This new policy represents something new in co-operative effort. It means that the members will be charged only in the first instance the bare cost of operating the elevator facilities and no service or elevator charges will be made. At the end of the year the actual operating cost will be available and will be deducted from the final Wheat Pool payment.

SIXTEEN-HOUR DAY FOR NEW ORLEANS INDUSTRIAL CANAL.

The Board of Commissioners of the Port of New Orleans have extended the daily service of the Inner Harbour Navigation Canal from 12 to 16 hours corresponding to the service hours already existing on the lock section. This action was taken on the urgent representations of the users of the canal, including the industrial tenants of the board located on its banks. It was encouraged by the fact that the number of transits through the canal has shown a steady and important increase regularly every month for the past year. The operating hours on and after August 1st will be from 6 a.m. to 10 p.m.

IMPORTANT CONTRACTS FOR TYNESIDE.

It is announced that Sir W. G. Armstrong, Whitworth & Co., Ltd., have booked the following contracts.

A special twin screw steamer with triple expansion propelling machinery for the Corporation of Trinity House of London.

A 10,300 ton oil tanker with Diesel propelling machinery for Messrs. John I. Jacobs & Co., Ltd., of London.

An 11,000 ton oil tanker with Diesel propelling machinery for Aktiebolaget Olson & Wright, of Stockholm.

These two latter vessels will bring the total tanker tonnage constructed by the Company to nearly a million tons dead weight.

They have also secured contract for 25 super-heated locomotive boilers and six boiler shells from the Buenos Ayres & Pacific Railway Company for delivery within six months.

These boilers are to be shipped to Buenos Ayres on one of the special locomotive carrying vessels constructed by the firm.

The building of three twin screw Diesel Engined cargo vessels, each of 8,500 tons deadweight, fitted with refrigerating equipment for Messrs. Westfal-Larsen & Company A/S, of Bergen.

NEW WIRELESS BEACON STATIONS.

The installation of wireless beacon stations at suitable places round the coasts of the British Isles is proceeding rapidly. The Marconi Company have already erected six stations which are now in operation, and seven more have now been ordered.

Among those stations now in operation, the Mersey Bar, Coningbeg and Spurn are on lightships, while those at Skerries, Round Island and Caskets are on land. One of the great advantages of the system of position finding in which a beacon station is used in conjunction with a direction finder on board ship, is that the beacon can be installed in any position as it does not require a fixed zero point. This makes it particularly suitable for lightship installations, and allows navigators to lay off their wireless bearings on familiar points on the chart. Another advantage is that the determination of bearings is under the direct control and supervision of the navigating officer, who otherwise has to be satisfied with his position as given by a shore direction finding station on request.

The next seven stations to be erected, and for which apparatus is now being constructed, are at Start Point, Lundy Island, Sule Skerry, Dungeness, South Bishop, Cromer and Kinnaird Head. Beacon transmitters are projected also for Tory Island and Mizen Head.

Each beacon transmitter has a distinctive call signal sent at a speed which enables it to be identified even by inexperienced and unskilled listeners, and as they work on a specially allotted wave-length they are generally free from interference from other services. They are therefore ideal aids to navigators in any weather conditions and can be used for bearings by skilled operators with direction finders or by navigators unskilled in wireless work, using a bearing indicator.

NEW ORLEANS DOCK BOARD ESTABLISHES FOREIGN TRADE SOLICITATION OFFICE IN CHICAGO.

Announcement was made by the Board of Commissioners of the Port of New Orleans on July 12th of the establishment in Chicago of a foreign trade solicitation office. The office is located at 1701 First National Bank Building, and is in charge of Mr. William Allen, foreign trade representative of the Board.

CONTRACT FOR SHEET METAL WORK ON POYDRAS SHED.

On July 12th, the Board of Commissioners of the Port of New Orleans authorized their general manager to contract with the American Sheet Metal Works in the sum of $34,151.80 for furnishing all materials and erecting the sheet metal work of the $2,000,000 green coffee shed which is being built at Poydras Street. Contracts awarded to date total nearly $1,200,000 on this project. This present contract involves the erection of some 57,000 square feet of corrugated metal siding, and numerous incidentals. Work is to begin in 10 days and be completed in 50 days.

NEW COLD STORAGE TERMINAL AT HALIFAX, N.S.

The contract for the erection of a new modern cold storage plant costing $2,500,000 at Halifax, N.S., has been awarded to the Foundation Company, Limited, Montreal, by Messrs. Drury and Company, Limited, of Montreal, promoters of the project.

In view of the special conditions connected with apples and potatoes, the construction of the warehouse for these products will be expedited in order that it may be ready to handle business next autumn. It is hoped to have the fish and cold storage warehouses sufficiently advanced for business by February or March, 1929.

CANADIAN ENGINEERING COMPANIES SECURE IMPORTANT CONTRACTS.

The award of a railway contract valued at twenty million dollars by the Government of the Republic of Colombia to the P. Lyall and Sons Construction Company, Ltd., Montreal, is stated to have been confirmed. Twenty leading contractors in England, the United States, France and Germany submitted tenders. The Canadian firm is to perform on a cost-plus basis the work which is the building of a railroad to connect Tunja and Belez.

The Northern Construction Company and Brigadier-General J. W. Stewart, of Vancouver, have secured a contract for the construction of a 14-mile tunnel near Boston, Mass., at a cost of ten million dollars. The tunnel is in connection with the water supply of the City and construction, which commenced on May 1st, is estimated to necessitate three years' work before completion.

LAUNCH OF H.M.S. MEDWAY.

The launch of another vessel for the British Navy took place at the Naval Construction Works, Barrow-in-Furness, on the 19th inst., when H.M.S. Medway was christened and launched by Lady Chatfield, the Wife of Vice-Admiral Sir A. Ernle Chatfield, K.C.B., K.C.M.G., the Third Sea Lord and Controller of the Navy.

The Medway is a steel twin-screw vessel, 545 feet B.P., and has been built to act as a depot and repair ship for submarine flotillas. She has ample internal space to accommodate, in addition to her own complement and repair staff, the whole of the officers and crews of the submarines attached to her.

The vessel is specially designed for prolonged service in tropical as well as cold climates.

The workshops include foundry, machine shop, plate shop and smithy, torpedo shop, plumbers shop, etc., of large areas, which are fitted up with all necessary machines, etc., to carry out repair work in connection with submarines.

The main propelling machinery of the ship consists of a pair of double-acting, two-stroke internal combustion engines, made by Messrs. Vickers-Armstrongs Limited, under license from Messrs. Maschinenfabrik Augsburg-Nurnberg, A.G. Each engine has four cylinders, and is designed to develop 4,000 brake horse power at about 115 r.p.m.

The bedplates, which are of the flat bottom type, and the scavenge pumps, which are engine driven and of the tandem double acting type, are of Barrow design. In many points of detail, slight alterations have been made to meet British practice or Admiralty requirements. Solid injection not having yet been developed for these engines, the normal air injection system is used.

The engines, which represent an innovation in this country, are rapidly nearing completion, preliminary trials being now in progress and proceeding satisfactorily.

Hudson Strait Expedition.

Hydrographic and Tidal Survey. Provision of Ice Breakers and Direction Finders Recommended.

INTRODUCTION.

THE decision having been reached by the Government to complete the Hudson Bay Railway and Terminals, it was decided early in January, 1927, to send an expedition to Hudson Strait to obtain accurate information in regard to ice conditions, and to study the requirements necessary to ensure safe navigation.

For transporting the men and equipment to Hudson's Strait the Canadian Government ice-breaking steamer "Stanley" and the freight steamship "Larch" were put at the disposal of the expedition, which left Halifax, N.S., on July 17th, 1927. Two Fokker airplanes, with accessories, were taken with the expedition and survey flights began on September 30th, and have been carried on through the winter.

C.E., the Department of Railways and Canals, and Group Captain J. Stanley Scott, Royal Canadian Air Force, the Department of National Defence.

This board met for the first time on February 4th, 1927, and continued to meet regularly until June 28th, and was responsible for the organisation of the expedition up to the date of its departure from Halifax.

GENERAL PLAN OF OPERATIONS.

The general plan of operations as worked out by the Advisory Board made provision for three bases, one at the east end of the Strait, one at the west end and one half way between these two. This plan was finally accepted by the Deputy Ministers of the Departments of Marine and Fisheries, Railways and Canals, and National Defence.

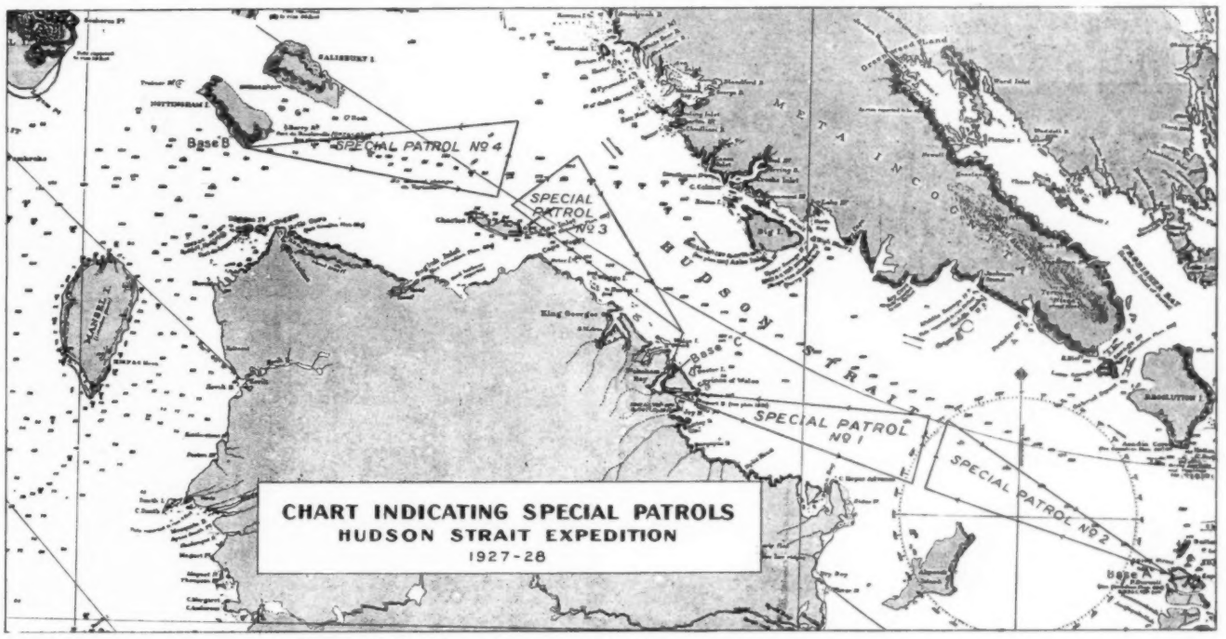


Chart indicating Special Patrols of the Hudson Strait Expedition, 1927-28.

Among the recommendations made in connection with the navigation services consequent on the completion of the Hudson's Bay Railway to Fort Churchill are the provision of two ice-breakers on Hudson's Straits and the establishment of direction-finders, together with a hydrographic and tidal survey. The report intimates that ice was met in the Straits on July 26th, but that there was nothing to prevent a commercial ship passing through, provided that it was navigated with caution. The first ice seen in the autumn was on November 16th. Dealing with fog conditions, the Report suggests that when records have been compiled covering a period of from 12 to 15 months they will show that conditions are no worse than on the Nova Scotia Coast, and it is therefore believed that with those modern aids to navigation suggested vessels will be able to proceed through the Straits with reasonable expectation of safety.

Mr. N. B. McLean, officer in charge of the Expedition from February 11th, 1927, until January 1st, 1928, acknowledges the valuable assistance afforded by the Ministry of Marine at Ottawa, the Canadian Air Force and the Department of Railways and Canals. Credit for the successful establishment of the three bases before winter set in was due to the untiring efforts of the personnel and the expedition and willing co-operation, at times under very trying conditions, whilst the work of the crew of the C.G.S. "Stanley," under Captain John Hearn, helped in great measure to make the expedition a success.

The Government laid down the general lines on which the expedition was to be conducted, viz., the establishing of several airplane bases in the strait, with all the necessary equipment for a period of sixteen months.

An Order in Council (P.C. 85), dated January 22nd, 1927, provided for an Advisory Board consisting of three members, one from each of the departments concerned, viz., Marine and Fisheries, National Defence, and Railways and Canals. Mr. N. B. McLean had the honour to be appointed Chairman of this Board and Officer in Charge of the Expedition, representing the Department of Marine and Fisheries, with Mr. E. B. Jost,

EQUIPMENT AND STORES.

On February 11th authority was granted for the purchase of supplies generally. The placing of orders for stores, materials and equipment began almost immediately afterwards, and continued until a day or so before the expedition left Halifax. Arrangements were made for the use of Shed 22, Ocean Terminals, Halifax, and all the material belonging to the expedition was eventually assembled there. A contract was made for the building materials all cut and fitted ready to set up, and another contract was arranged for their erection at the different bases. The general equipment of the three bases was practically the same and the following list is characteristic of any base:—

2 Fokker airplanes, complete with floats, skis, and wheels for landing, and all necessary accessories, including spare engine.
One 30 ft. motor launch.
1 Fordson tractor.
7 buildings, comprising officer's dwelling, men's dwelling, radio building, storehouse, blubber house and two hangars.
Bricks, sand in bags, cement in barrels.
Radio apparatus—2 gasolene engines to generate power with two 150 ft. steel masts.
326 drums of gasolene (45 gallons each).
38 drums of coal oil.
125 cases Ethyl airplane spirits (8 gallons to a case).
125 cases lubricating oils (8 gallons to a case).
160 tons hard coal in bags.
Stoves, beds and bedding, clothing.
Provisions for sixteen months.
Dishes and cooking utensils.
2 dories.
1 Vercheres skiff.
Guns, rifles and ammunition.

It may be here stated that after the bases had been established it was found that no essential had been omitted.

TRANSPORTATION.

For transporting the men and equipment to Hudson Strait the C.G.S. "Stanley," an ice-breaker, after being strengthened and generally repaired, was put at the disposal of the expedition, and the s.s. "Larch," a freighter of 3,564 gross tons was chartered.

Base "A." Mission Cove, taken from Mission, looking towards Hudson Bay Company's Cove.

LOADING.

Loading began at Halifax, July 4th, and was completed July 16th, the "Stanley" being a small vessel, was only able to take care of her own stores and passengers, while the "Larch" carried 2,700 tons of coal intended for both ships, as well as 2,585 tons of general cargo.

DEPARTURE FROM HALIFAX.

On July 17th, at 3 p.m., the "Stanley" with her consort the "Larch," left Halifax with all the members of the expedition on board and proceeded to sea. The "Stanley" carried the personnel of the expedition consisting of 39 all ranks, four electricians, the building inspector, and a crew of 50, under Captain John Hearn, Master, and Albert Theriault, Chief Engineer.

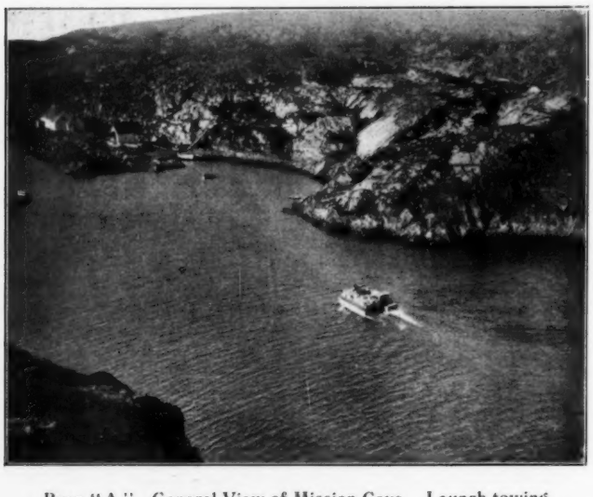
The "Larch," with Captain Balcom as Master, had on board a construction crew of 46 men, six riggers, one timekeeper, two cooks, two assistant cooks and her own crew of 28 men.

CONDENSED REPORT—JULY 17th TO NOVEMBER 25th, 1927.

The expedition left Halifax July 17th and arrived at Port Burwell, July 27th; disembarked party to remain for the purpose of locating a site for the base.

Left Port Burwell July 28th, proceeding west, arrived Nottingham Island August 2nd, located site for Base "B" on August 3rd. Work of erecting the buildings at this Base began August 7th. Time engaged Nottingham Island unloading, 14 days.

Left Nottingham Island August 18th, arrived Ashe Inlet, Big Island, August 19th. All day 20th looking for suitable site without success. Went to Lake Harbour August 21st. Employed part of 21st, 22nd and part of 23rd as above and again without success.



Base "A." General View of Mission Cove. Launch towing loaded Scow.

Left Lake Harbour August 23rd, arrived Wakeham Bay August 24th, found suitable site for Base "C," near Hudson's Bay Company's post, and commenced unloading. Began erecting buildings August 25th. Finished unloading at Wakeham Bay September 9th, took coal September 10th. Time engaged 17 days unloading and taking coal at Wakeham Bay.

Left Wakeham Bay September 11th, arrived Port Burwell September 12th. September 12th looked over situation, decided on sites for hangars, store-house and power-house, and to rent Old Mission building from the Hudson's Bay Company for housing the personnel of Base "A." Began unloading September 12th and finished October 1st. From October 1st to 3rd coaling "St. Ann," "Hopper Barge No. 2" and "Stanley." Twenty-one days at Port Burwell unloading and coaling.

On morning of October 4th left Port Burwell, proceeding towards Wakeham Bay, arriving there October 5th. On this date after arrival made repairs to engines and steering gear. October 6th discharged additional lumber for buildings. Friday, October 7th, left Wakeham Bay for Nottingham Island, arriving there the next morning. Discharged some material, inspected buildings, took aboard construction crew and left again for Wakeham Bay the same day, arriving there the following morning.

From October 8th until October 15th the work of finishing the buildings at Wakeham Bay was rushed, and on the latter date was finished.

On the morning of October 16th the Officer-in-Charge transferred ashore with Mr. O'Malley, Secretary, and Mr. Valiquette, Photographer. The "Stanley" and "Larch" left after taking the construction crew aboard, and arrived at Port Burwell the next day.

The "Larch" left Port Burwell October 18th for Halifax, having the construction crew on board with the exception of ten men who were retained to finish the buildings at Port Burwell. This vessel arrived at Halifax on October 24th.

The buildings at Port Burwell were completed October 28th. This completed all the construction work which had been laid out for the season.

Base "B." Hauling Gasolene up Slipway.

From October 16th until October 28th the leader remained at Base "C," Wakeham Bay. Owing to ill-health it was found necessary that he should return to Ottawa. He left Wakeham Bay with Mr. O'Malley October 29th on the s.s. "Nascopie," arriving at Port Burwell October 30th, and transferred to the "Stanley."

Owing to the fact that it was necessary for him to return on the "Stanley," it was decided by the authorities at Ottawa that an officer should be sent to Major Lawrence at Wakeham Bay to advise him on matters pertaining to navigation and ice. Captain A. A. King, First Officer of the "Ocean Eagle" was appointed. He left Port Burwell for Wakeham Bay on the "Ocean Eagle" November 6th and reported to Major Lawrence on the 7th.

From October 30th until November 11th at Port Burwell. On the morning of November 3rd the "Canadian Raider" dragged anchors and touched bottom in a gale of westerly wind. Engaged from November 3rd until November 11th helping to beach and lay up this vessel in the Hudson Bay Company's cove for the winter.

Left Port Burwell accompanied by the "Ocean Eagle," on November 11th and proceeded south with remainder of construction crew and part of the crew of the "Canadian Raider" on board, 95 in all. On the night of the 12th and again on the night of the 13th we encountered very severe storms. The house and hand-steering gear of the "Stanley" were considerably damaged. Nigger Cove, Strait of Belle Isle, was reached November 14th, where we remained two days overhauling and repairing. It was decided it was unsafe to take the ship across the gulf and on the 17th proceeded towards Quebec, working from harbour to harbour and finally reached there on the morning of November 25th.

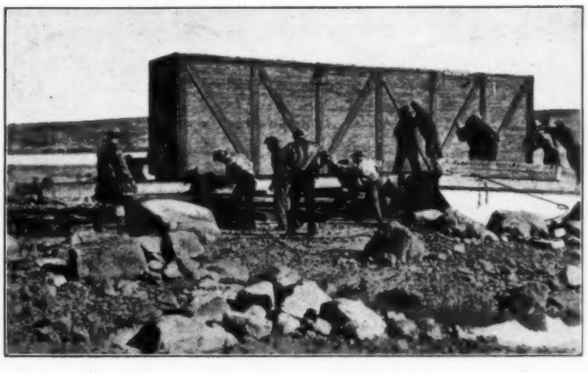
FLYING OPERATIONS.

The first flight was made from Base "C," September 30th, from Base "B," October 11th, and from Base "A," October 19th. Flying has been carried on since these dates whenever

Hudson Strait Expedition.

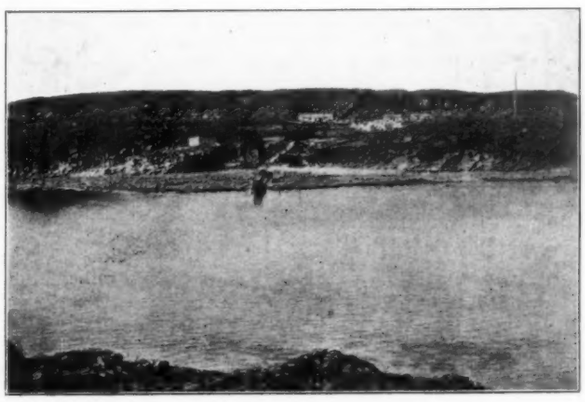
Base "B." Fusilage Case being hauled up Slipway by Tractor.

Base "B." Erecting Buildings.

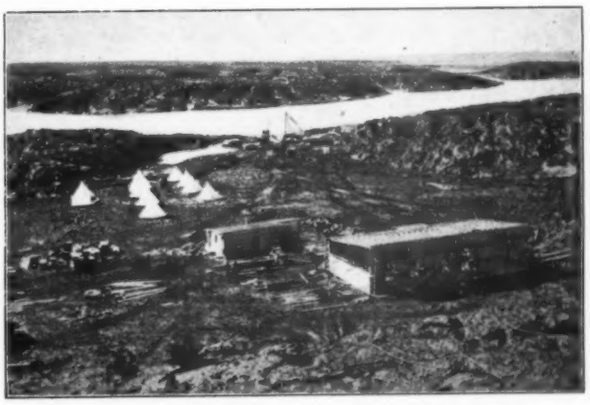


Base "B." Unloading Fusilage Case.

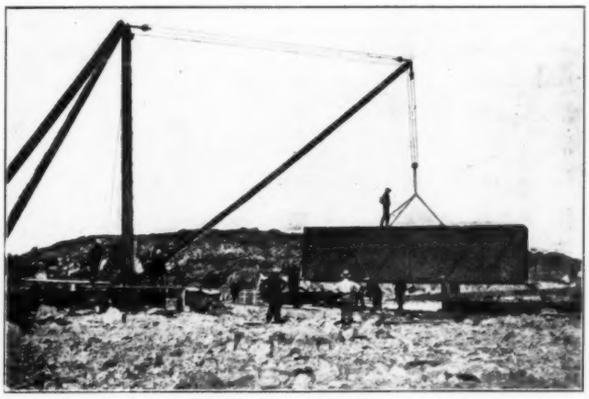
Base "B." Unloading Lumber to Slipway.



Base "B." View from far side of Inlet (left to right): Blubber House, Scow unloading, Buildings and Radio Mast.



Base "B" (left to right): Camp, Temporary Shack, Derrick, Men's Dwelling and Inlet beyond Derrick.



Base "B." Fusilage Case being lifted by Derrick.

Base "B." Completed Buildings (left to right): Temporary Shack, Men's Dwelling, Officer's Dwelling, Storehouse, Power House, Plane to Ground Radio Mast and Marconi Mast.

the weather was favourable. These flights might have been commenced earlier, but as it was known that there was no ice, every effort was made to get the personnel under cover as soon as possible.

Base "C." Wakeham Bay: Buildings on Flat abreast of "Stanley." Hudson Bay Company's Post in right foreground.

ICE CONDITIONS.

On July 26th heavy open ice was first met abeam of the Four Peaks on the Labrador coast, about 60 miles south of Cape Chidley. This ice was more or less encountered all the way to Nottingham Island. At certain points the ships would be in clear water but there was ice in sight at either side. In some instances this ice was formed into narrow strips lightly packed. There was nothing to prevent any commercial ship passing through this ice, provided it was navigated with caution. No ice was observed at Nottingham Island after August 6th, but it is probable that the strait was not completely clear until a somewhat later date. The first ice seen in the autumn was on November 16th. This ice was reported as floe ice about five miles off Nottingham Island.

It is to be especially noted that the Fox Channel ice did not come out this season.

FOG CONDITIONS.

The prevalence of fog in Hudson Strait at first sight appears to be rather serious. For instance, from the time we entered the strait until some days after we reached Nottingham Island there was hardly a day that this condition did not maintain more or less. It is believed, however, that when the records are compiled for a period of from 12 to 15 months they will show that this fog condition is perhaps no worse than on, say, the Nova Scotia coast, and it is worse at certain periods of the year and at certain sections of the strait. Until such time as the ice has cleared the strait vessels running in fog must navigate with caution. To offset the dangers from fog we have direction finders. These properly placed will enable vessels to proceed up and down the strait with freedom and safety.

Attached hereto is a copy of the log of the expedition from the date of leaving Halifax, July 17th, until return of the C.G.S. "Stanley" to Quebec, November 25th, 1927.

SYSTEM AT BASES.

A reconnaisance was first made with the small "Moth" plane carried aboard the "Stanley" for that purpose, and a report made by air officers on any apparently suitable site found. This was checked on shore and if satisfactory adopted. It may here be said that the "Moth" plane proved most useful and saved the expedition a very great deal of time and labour. After the site had been selected the beach was improved where necessary and tractors, slipway and derricks sent ashore, the slipway being laid down and the derricks set up. Materials and stores of all kinds were discharged to the beach in surf boats and the small scow which had been provided. This scow proved to be also a very valuable adjunct to the expedition on account of its capacity for carrying heavy loads or cumbersome loads such as wing cases. Surf boats were unloaded at the beach to stone boats or jumpers, which in their turn were hauled by the tractors to the position where they were required, the lumber for instance all being sorted as it came ashore was taken to the site of the building for which it was intended. It may be said of the tractors that had they been omitted making it necessary to man-handle all the materials and equipment it is entirely unlikely that the work could have been completed before the winter set in. It should be mentioned that the building material had all been cut to size and put up in bundles properly marked. The erection of the buildings was begun as soon as possible and an effort made to get one or two roofed so that the personnel and construction crew could be under cover and fairly comfortable before the departure of the "Stanley" and "Larch" for the next station. When the cargo was discharged the ships proceeded to the next base leaving a certain number of the construction crew and the personnel to complete the work.

DESCRIPTION OF BASES.

BASE "A" PORT BURWELL.

Base "A" is situated at Mission Cove and Fox Harbour, Port Burwell. Mission Cove lies in the North-west arm of Port Burwell Harbour, the inner end being about one-half mile from the anchorage. Fox harbour, which leads in a north-westerly direction to Hudson Strait, is separated from Mission Cove by a bar which may be crossed for about three hours at the high stage of the tide. Owing to the lateness of the season and the difficulties of the terrain, it was decided to rent the Old Mission building belonging to the Hudson's Bay Company for the housing of the personnel, to erect the power house near it, and to build the hangars and storehouse about one-third of a mile away at Fox Harbour. Considerable difficulty and delay was experienced at this base as there were a great many boulders that had to be removed before the foundation sills could be laid. Flying operations will be conducted from Fox Harbour, the planes being launched and landed there.

BASE "B."

Base "B" was located at the southernmost corner of Nottingham Island, about one-half mile from the mouth of an inlet running approximately north and south. This inlet as well as being excellent for taking off and landing, also provides excellent shelter. The buildings were erected in a small meadow sloping towards the inlet and completely surrounded by low hills and ridges. The hangars here were also placed as near the high water mark as possible for convenience in launching the planes. The general situation at this base is better than at either of the others as there is less rise and fall of tide and better shelter for buildings and planes.

BASE "C"—WAKEHAM BAY.

Wakeham Bay, on the south side of Hudson Strait, about half-way between Port Burwell and Nottingham Island, was selected as the site for Base "C." The buildings were erected on the east side of the bay half a mile from the Hudson's Bay Company's post and slightly further from the post of Revillon Freres. The bay abreast of the station is about four miles in width, decreasing to a mile and a half at the entrance, which is approximately eight miles to the north. The buildings were all erected in a small meadow sloping slightly to the beach with a fine stream of water on one side. The hangars were placed just above extreme high water mark and planes may be launched at any stage of the tide as the beach has been improved. The situation generally is satisfactory, the buildings being conveniently located and at sufficient distance apart to provide for safety in case of fire.

FLYING OPERATIONS.

The first plane took the air at Wakeham Bay on September 30th, followed by one at Nottingham Island on October 11th, and the third at Port Burwell, October 18th.

Flying operations might have been commenced earlier, but as it was known there was no ice, every effort was made to complete the bases and get the personnel under cover as soon as possible.

Instructions were issued to carry out routine or special flights twice daily whenever possible, and the courses to be followed on these flights were laid down on charts provided for the purpose.

Routine flights, owing to adverse weather conditions, such as low lying clouds and fog, were the exception rather than the rule, but the planes were in the air whenever opportunity offered as the flying personnel was very keen, being always on "stand by" and always ready to take off.

Part of the information under the heading "Ice conditions" was compiled from reports made by the Officer in Charge of Air Operations.

Base C." Moth Plane.

It was impossible, owing to weather conditions, to carry out flying operations as freely as was expected, but nevertheless a great deal of very valuable information was obtained.

Hudson Strait Expedition.

Base "A." Boulders being removed on Site of Power House. Mission in background.

Base "A." Hangars were erected in little Flat near Derrick. Scow being unloaded. Many Boulders had to be removed.

Base "A" (left to right): Entrance to Mission Cove, Hudson Bay Company's Cove and Post, C.G.S. "Stanley."

Base "A." Fox Harbour, looking towards Hudson Strait. Derrick marks Hangar Site.

Base "B" (left to right): Temporary Shack, Men's Dwelling, Storehouse and Power House.

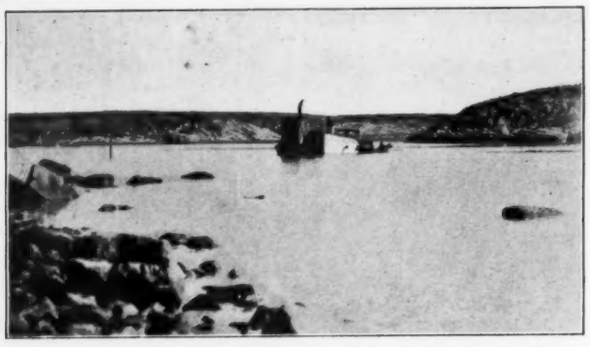
Base "B" (left to right): Power House, Camp, Storehouse, Temporary Shack, "Larch," "Stanley," and Men's Dwelling.

Base "C" (left to right): Storehouse, Men's Dwelling, Entrance to Bay, Revillon Freres, Hudson Bay Company.

Base "C," showing improved Beach (left to right): Scow grounded with Spare Wing Case, "Stanley" alongside "Larch" coaling. Right foreground: Tractor and Stone Boats.

RADIO COMMUNICATION.

At each base provision was made for radio communication. At the earliest possible moment after the equipment had been discharged the power houses were constructed, masts erected and apparatus installed.



Base "B." Launch bringing in Scow with Fusilage Case.

C.G.S. "STANLEY."

Direct communication between the "Stanley" and Ottawa, after many experiments and adjustments, was finally established while at Wakeham Bay and maintained with very few breaks until this vessel had arrived at Quebec. This is a very satisfactory record as the "Stanley," though fitted with very fine apparatus, had not nearly as good an aerial as those used on shore, and was also subjected to much interference not encountered at the shore station.

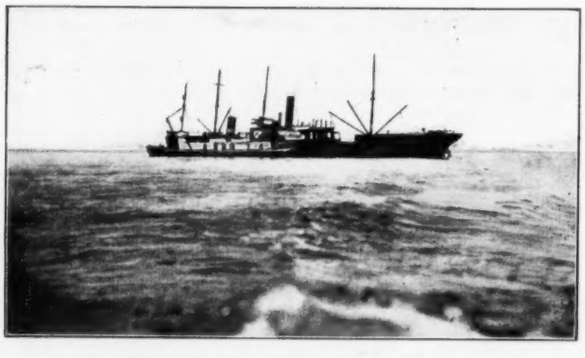
The following records were made from the "Stanley." Message sent to Ottawa and answer received in seven (7) minutes. Message sent to Ottawa, telephoned to Montreal and answer received in twenty-one (21) minutes.

ICE CONDITIONS.

On July 26th the first ice was met abeam of the Four Peaks on the Labrador coast, about 60 miles south of Cape Chidley. This ice, which would be classed as heavy open ice, was encountered more or less all the way to Nottingham Island. At certain points the ships would be in clear water but there was always ice in sight on either side. At times it was formed into narrow strings lightly packed. There was, however, nothing to prevent a commercial ship passing through, provided it was navigated with caution. No ice was observed at Nottingham Island after August 6th, but it is probable that the Strait was not completely clear until a somewhat later date.

The first ice seen in the autumn was on November 16th, and was reported as floe ice, about five miles off Nottingham Island. From this date the ice was gradually increasing. On November 29th, 60 per cent. level floe ice south and west of Nottingham Island with no definite leads was reported by an air patrol; December 16th from an air patrol we find 70 per cent. floe ice connected by slob with hardly any open water; on the 23rd the air report gives 70 per cent. fairly heavy floe ice between Nottingham Island and Erik Cove with no definite leads, and on the 31st observation from shore reports no open water in sight but visibility poor.

Coming east to Wakeham Bay, no ice was reported until December 3rd, when field ice was observed from shore to the north-east. On December 12th much slob ice is reported but no field ice. The report from the air on December 19th gives pan ice and open water in the strait, and on December 29th the air patrol reports only about 10 per cent. open water, ice formation becoming heavier with no definite leads.



Base "B." "Stanley" taking Coal from "Larch."

At Port Burwell no ice was seen during the month of November, but observation made only from shore as weather unfit for flying. From December 1st to 12th inclusive shore observation reported a little floe ice but mainly slob. An air patrol on December 12th stated that the centre of the Strait was open and navigation possible. Shore observation reported ice gradually increasing and for a few days at the end of the month no water visible, all the ice slob.

From the foregoing it would appear that the ice forms first at the west end of the strait and works and forms to the eastward as the season advances.

It is to be noted that the heavy Arctic ice known as the Fox Channel ice and reported by Hudson's Bay Company officials, navigators of these waters and others as coming out every autumn did not come down this season.

FOG CONDITIONS.

The prevalence of fog in Hudson Strait at first sight appears to be rather serious. For instance, from the time the expedition entered the strait until some days after it reached Nottingham Island, there was hardly a day that this condition did not maintain more or less. I believe, however, that when the records are compiled for a period of from twelve to fifteen months they will show that this fog condition is perhaps no worse than say the Nova Scotia coast, and that it is worse at certain periods of the year and at certain sections of the strait.

FOG RECORDS.

July 28th to 31st.—Between Port Burwell and Nottingham—fog observed every day—one day eight hours' duration.

August 2nd to 13th.—Fog observed on nine days at Nottingham Island—once for ten hours, twice for six hours.

August 20th to Semtember 11th.—Between Ashe Inlet, Lake Harbour and Wakeham Bay—fog on nine days, twice for six hours and once for four hours.

September 12th to 25th.—Fog on eight days at Port Burwell—once for six hours.

October 12th to 14th.—Fog two days, Wakeham Bay.

November 7th.—Two hours' fog at Port Burwell.

Base "B." Completed Buildings. "Stanley" at Anchor.

Fog was recorded on thirty-three (33) out of one hundred and thirty-seven (137) days between July 28th and November 11th.

The above record does not mean that vessels had to cease running, as the fog varied greatly in density, sometimes the "Stanley" was forced to proceed "dead slow," at others "half speed," and it was only on two or three occasions that she had to be brought to a complete stop.

ICEBERGS.

A few icebergs were encountered by the "Stanley" on the four trips she made through the strait, some of them being as far to the westward as Charles Island.

RECOMMENDATIONS.

ICE-BREAKERS.

Having in view the air operations being carried out in Hudson Strait for the purpose of obtaining information in regard to ice conditions prevailing there, the Officer in Charge was strongly of the opinion that an ice-breaker should be operated in addition to the planes, in order to amplify this information and make it as full and complete as possible.

It was recommended that an ice-breaker be sent to Hudson Strait to arrive not later than June 1st, and that it should work back and forth between Resolution Island and Coats Island until such time as the strait was practically clear of ice. In this way very accurate information would be obtained as to the nature of the ice. This vessel should also be at the west end of the strait for observation purposes when the ice begins to make in the autumn and should remain there taking note of the formation and ice action until driven out by the advancing ice.

As ice-breakers are required for the St. Lawrence, it is reasonably certain that vessels of this type will be required for the Hudson Bay route, and as it is doubtful if we have one of these vessels in the St. Lawrence that could be spared or that is suitable, we suggested that an endeavour be made to purchase one in Europe, provided always that a ship could be found to meet the requirements and could also be ready for work in Hudson Strait for June 1st. In the event of a vessel such as is required not being in the market, the only

alternative would be to have one built, which would take time, or to use the C.G.S. "Montcalm," if possible next season only. In the event of the "Montcalm" being used she must be followed by a vessel with an additional coal supply, this ship to be ready to enter the strait as soon as it is reasonably clear of ice.

To take care of the traffic that it is expected will be attracted to the Hudson Bay route at least two modern ice-breakers will be required, one based on Port Churchill, and the other probably at Wakeham Bay in Hudson Strait, where there is an excellent land-locked harbour.

As it is reported that the ice on the north shore of the strait and in the bay generally is clear at an earlier date than on the south, it might be advisable to make search on the north side for a suitable fueling base before deciding definitely on Wakeham Bay.

The question of fuel for these vessels would have to be taken care of. For the ship based on Port Churchill the fuel could be brought in by rail or by water, but for the other based at Wakeham Bay a vessel would have to be stationed there. A collier or oil tanker would probably be preferable to a coal or oil base on shore for the reason that it may be moved about from place to place, which at times might be very necessary. Both vessels should use the same fuel as it is possible that either of them might require to refuel at Wakeham Bay or Port Churchill.

AIDS TO NAVIGATION.

The first of these aids to be established should be direction finders. They may be of two types—direction finders on shore or direction finders on ship with radio beacon on shore as may be decided.

The number and positions of these stations is a matter to be decided by the Department of Marine and Fisheries, but they might be located and erected in the same manner as the bases of the Hudson Strait Expedition.

A satisfactory arrangement would be two stations at the eastern entrance to the strait, one possibly at Big Island, or Charles Island, the present Nottingham Island station, and one on Coats Island, or Mansell Island, as may be found best. The two stations at the eastern end would fix the position of a vessel and enable it to enter the strait in any weather. The intermediate station in the strait would allow a position to be fixed for a certain period of the run, and the Nottingham and Coats, or Mansell Island stations would fix the position of ships in the vicinity of Nottingham Island and from that point to Coats Island.

Fog alarms and lights may be necessary, but it is possible that direction finders alone will be all that is necessary.

HYDROGRAPHIC AND TIDAL SURVEY.

Where it has not already been done it would be advisable to fix prominent points of islands bordering on the route by astronomical observations taken on shore, using the artificial horizon, in order to make sure that these islands are as actually shown on the chart.

These does not appear to be any very definite or exact information available in regard to tides and currents in Hudson Strait, more especially at the western end. It is therefore suggested that an endeavour be made to obtain this information, commencing say in the vicinity of Digges Island, following that by work between Coats and Mansell Islands, or perhaps about Charles Island.

In order that the work of establishing aids to navigation, etc., in Hudson Strait may keep pace with the work on the railway terminals, and as it is to be expected that the traffic through the strait will be immediately increased, owing to the railway operations, it would appear that a decision should be reached in regard to the carrying out of the above suggestions in whole or in part, in order that preparations may be put in hand at once and a commencement made early in the summer of 1928.

APPENDICES ATTACHED TO REPORT OF THE EXPEDITION COMPRISE:

Copy of the Log of the Expedition,

Plan showing location of Bases,

Plan showing Routine Flights Base "A," copy of orders covering same attached,

Plan showing Routine Flights Base "C," copy of orders covering same attached,

Plan showing Routine Flights Base "B," copy of orders covering same attached,

Plan showing Special Flights, copy of orders covering same attached,

Copy of Meteorological and ice observations made at Bases "A," "B" and "C," from November 9th to December 31st, 1927.

Sea Water Temperatures at Bases "A," "B" and "C" to December 31st, 1927, and photographs.

New 80-ft. River Entrance Lock, Birkenhead.

The Rt. Hon. The Earl of Derby, K.G., on July 21st, officially opened the newly constructed river entrance lock leading to the Alfred Dock, Birkenhead.

The site was occupied formerly by two smaller locks, one 398-ft. long by 50-ft. wide, and the other 198-ft. long by 30-ft. wide, constructed in 1865 and opened by H.R.H. The Duke of Edinburgh on the 21st of June, 1866.

The length of the new lock is 600-ft., and, for economy in the use of water when locking small craft, this length may be subdivided when required into two compartments, one of 400-ft. long and the other 200-ft. long. The width of the lock is 80-ft., and the entrance from the river is so formed that vessels entering or leaving will be able to do so without any difficulty. The sill or floor of the lock has been constructed at a depth of 12-ft. below Datum, affording a depth of 40-ft. 4-in. at average high water level of spring tides The maximum depth hitherto available for vessels entering the Birkenhead Docks has been 36-ft. 7-in., so that apart from the advantages to be derived from the increase of depth in respect of times for entering and leaving the docks, East-bound vessels can in future be loaded to the maximum draft that can be taken through the Suez Canal, after allowing for the lightening ensuing en route from coal consumption, etc. The river bed in the fairway to the lock has been deepened accordingly over an area sufficient for all needs.

The equipment includes three pairs of steel gates, each leaf weighing about 210 tons. The gates are operated by hydraulic machinery of the most modern and serviceable type, similar to that at the recently completed Gladstone Docks, Liverpool. Gangways for pedestrians have been provided over two sets of gates. Special sills and quoins have been provided, so that in the event of the lock requiring to be dried for repairs, the working gates can be reversed and used as dams.

Hydraulically operated sluices are provided for controlling the discharge of water into the lock for levelling purposes, the influx being distributed over the whole length of the lock in order to avoid disturbing ships waiting to be locked through. The lighting is electric, and the equipment includes beacon lights 90-ft. high, which will remove all difficulties attendant on the use of the lock in the dark hours.

The Birkenhead Docks are used almost exclusively by steamers trading with China, India, Japan and South Africa, and the s.s. Sarpedon, belonging to the Ocean Steam Ship Co., Ltd. (more familiarly known as The Blue Funnel Line), which was built at Birkenhead by Cammell Laird and Co., Ltd., will be the first vessel to pass through the new entrance lock to the river.

On the day of the opening ceremony there was a luncheon on board the Sarpedon at which Mr. Richard D. Holt, the Chairman of the Mersey Docks and Harbour Board presided. The vessel left her berth at the South Quay of the Alfred Dock at 2.30 p.m., proceeded into the new entrance lock and broke the black and white ribbon (Lord Derby's racing colours) which was placed across the inner end of the lock. At 2.40 p.m. Lord Derby declared the new river entrance lock open and the Sarpedon passed out of the lock and proceeded to the Prince's Landing Stage where the guests at the luncheon disembarked.

At the luncheon Mr. Holt proposed the toast of The Rt. Hon. The Earl of Derby, K.G., and the toast of the Chairman of the Mersey Docks and Harbour Board was proposed by the Mayor of Wallasey and supported by the Mayor of Birkenhead.

The opening of the new Alfred Dock entrance, Birkenhead, justifies one taking a backward glance to the beginnings of Birkenhead's dock history. Birkenhead owes its docks primarily to the natural deep water inlet, the Great Float, and upon this waterway the dock system was based. The scheme for making the docks at Birkenhead is due to William Laird, whose ambition it was to make the town a flourishing seaport on its own, apart from Liverpool. Sufficient financial support, however, was not forthcoming to develop his plans, and in 1858 the docks were taken over by the Mersey Docks and Harbour Board.

PRINCE OF WALES DOCK, SWANSEA.

The L.M.S. Railway have arranged to provide in connection with their coal tips at the Prince of Wales Dock, Swansea, a truck weighing machine for re-taring empty wagons, together with an office.

VICKERS (CRAYFORD) LTD.

Vickers Limited have floated a subsidiary Company—Vickers (Crayford) Ltd.—to take over their Works at Crayford, Kent, for the manufacture of motor bodies, variable speed gears, agricultural tractors, automatic looms and other engineering products. The registered offices are at Vickers House Broadway, Westminster, S.W.1, and the directors are Sir Robert McLean (Chairman), Mr. G. G. Sim, C.S.I., C.I.E., and Mr. Franklin E. Smith. Mr. H. H. Duvall, A.C.A., is the Secretary.

Port of Southampton Topics.

ENGINEERS INTERESTED.

The visit of the Institution of Mechanical Engineers to Southampton for its annual summer meeting resulted in some interesting views being expressed on the port and its facilities by engineering specialists. Incidentally, it also was marked by Mr. F. E. Wentworth-Sheilds, O.B.E., Docks Engineer of the Southern Railway Company, receiving some deserved praise on the part he is playing in the present development of the port. Mr. Wentworth-Sheilds had a number of interesting things to say in the course of a paper he delivered before the members. In speaking of graving docks, he made the point that in view of the fact that side-shores had been entirely abandoned for docking large ships in the floating dock it seemed quite likely that the costly process of inserting them would, before long, be abolished for large ships. Such ships had to be placed on three lines of keel blocks, and this arrangement seemed to render side-shores superfluous. In spite of the great increase in the size of vessels during the past 80 years, the lay-out of sheds and roads in the docks, he mentioned, differ very little from the arrangement first adopted, which was then peculiar to Southampton, but has since been followed at other ports. The cargo-handling equipment at the docks was the result of much careful thought and of many experiments. In this connection he said that there were two types of machines which have been invaluable for quick handling, and were so flexible that they did not interfere with movements other than their own—the quay crane and the electrically-propelled trucks. Nearly all the berths for the larger ships are equipped with electric cranes.

CARGO FACILITIES CRITICISED.

A piece of constructive criticism came from Mr. Cecil Bentham, of Manchester, during the meetings. He pointed out that Southampton had every natural advantage from the harbour point of view, but he sometimes felt that the ease with which the passenger traffic had been attracted to Southampton had caused the authorities to miss the point in dealing with cargo traffic. They had been able to ignore the medium cargo vessels which carried the bulk of the world's goods, and had not gone out of its way to make provision for those vessels coming into Southampton. Now that Southampton was becoming quite a suburb of London, with improved facilities in the roads as well as in the railways, Mr. Bentham thought it was time that Southampton began to take some notice of that point. It was the only port of its size in the country that had not got a large flour mill, which was a reflection on the easy discharge of grain. Mr. Wentworth-Sheilds said they did not want to keep goods in Southampton but to get them away to the consumer as fast as they could. He admitted that grain accommodation is not Southampton's strongest point, but said he thinks it will not be long before it will be improved. Mr. A. E. Marsh-Hienn, of the Supermarine Aviation Works, Ltd., did not think that Southampton was developing the aerial side of port requirements sufficiently.

A DECREASE IN DUES?

What has been described as "a mass attack" is being made by the shipping companies to secure a reduction in harbour dues. A letter was received by the Finance Committee of the Harbour Board from the local managers of the leading companies intimating that they would raise the subject, and the matter was passed over to a small sub-committee to enquire into. There seems a general hope among those not directly concerned that the committee will report against any reduction unless very sound reasons are given. As one member of the Board pointed out, the Board were increasing the facilities for shipping at the port and have spent thousands of pounds on improvements. No port in the country, it is claimed, can be entered by big vessels with greater safety than can Southampton. Are the Companies somewhat jealous of the municipality receiving one-third share of the harbour dues is a question which has naturally suggested itself in many quarters? The share is increasing because the amount of the dues is increasing, and it is suggested that the shipping companies think themselves entitled to a little of the increase.

CONTINENTAL SERVICES.

The series of special trips between Southampton and Spain inaugurated by the Spanish Transatlantic Company last year has been begun again. The "Reina Maria Cristina," which operated the service last season, has been again detailed for the service and begun her first trips to Southampton from Barcelona on July 4th. She will run on a regular schedule between Southampton and Spain until the end of September. The stated intention of the Company is to develop a regular service between Southampton and Spain, and they are prepared to add further vessels to the service if it progresses satisfactorily. Links between Southampton and the Continental ports are continually increasing in number, and the day has gone when the bigger Companies paid little heed to the requirements of passengers wishing to cross the Channel. The North-German Lloyd have decided to book passengers from Southampton to French ports by their transatlantic steamers. The N.G.L. has built up a big connection with tourists and business men travelling to and from Southampton and Bremen, but this is the first time since the war that passengers have been booked via Southampton for Cherbourg and Boulogne. The service began with the sailing of the "Columbia" on July 29th.

SHEER-LEGS AND SLIPWAYS.

An order to build a set of sheer-legs for the Canadian Gevernment has been received by Messrs. Day, Summers & Co., at Northam and the work is being pressed forward. It is designed to lift 40 tons and will be steam-driven. It was in 1862 that the patent for the firm's traversing tripod sheers was taken out by Mr. Charles S. Day and Mr. William Summers, and the firm have since then supplied sheer-legs to all parts of the world. Improvements in details have been made and in recent years the designs have been standardised as far as circumstances permit, though requirements are to such an extent that absolute standardization is impossible. The firm is also engaged in fulfilling an order by the Crown Agents of the Colonies for a slipway for use at Kigoma in Central Africa. The slipway is of a special design for hauling up broadside on, instead of from the end of the cradle. Excellent reports have been received of the efficiency of the slipway built at Northam for the new harbour at Takoradi, on the Gold Coast. The hauling-up cradle is a special double design, for dealing with vessels up to 650 tons dead-weight, and was erected there by the firm's own engineer.

Launch of the Single-Screw Oil Tanker "Caspia."

The single-screw tank steamer "Caspia," which has been built to the order of the Baltic Trading Company by Sir. W. G. Armstrong Whitworth & Co., Ltd., was launched from their Walker Shipyard recently.

The launching ceremony was gracefully performed by Miss Stewart, daughter of Mr. James Stewart, Managing Director of the Shipyard.

The principal dimensions of the vessel are: Length over-all, 427 ft.; length between perpendiculars, 412 ft.; breadth, moulded, 53 ft.; depth moulded to upper deck, 31 ft. 6 in.

The vessel is designed to carry 8,475 tons on a mean draft of 25 ft., and her speed on trial, when loaded to this draft will be 11 knots.

The vessel is of the two-deck type, with poop, bridge and forecastle, built to Lloyd's highest class, and framed on the longitudinal system.

The vessel is fitted with a straight stem and elliptical stern, and oil cargo is carried in nine double compartments, having two cargo pump rooms extending from side to side of the vessel.

The captain and officers are accommodated in steel houses on the bridge and upper bridge decks, the engineers in the poop and the seamen, firemen and petty officers in the forecastle.

Oil fuel is carried in a cross bunker at the forward end of the machinery space, and also in the fore deep tank.

Feed water is carried in the double bottom under the machinery.

The vessel is electrically lighted throughout, and is fitted with a ½ k.w. wireless installation.

A combined hand steam windlass, capable of working the bower anchors and cables is fitted on the forecastle head.

Two steam winches are fitted on the upper deck, and a warping winch on the poop.

A steam steering gear is fitted in a house at the after end of the engine casing on the poop deck, also a powerful hand gear on the rudder head.

The cargo oil pumps are three in number, two fitted in the after pump room and one in the forward pump room, together with a complete oil piping system.

The vessel is also fitted with a ballast pump and oil fuel transfer pump, arranged in pump room in fore hold for dealing with the forward ballast and fuel.

The propelling machinery consists of a set of direct acting, surface condensing, triple expension marine type engines of the most modern and improved design, having cylinders 27 in., 45 in., 75 in., with a stroke of 48 in.

The boilers, three in number, are of the cylindrical multi-tubular type, 15 ft. 9 in. diameter by 11 ft. 9 in. long, working at a pressure of 180 lbs., and fitted with forced draught arrangements; also a donkey boiler 12 ft. diameter by 10 ft. 6 in. long, with a working pressure of 120 lbs. per square inch.

The s.s. "Caspia" is the 156th oil tanker built by Armstrong Whitworth.

VICKERS (AVIATION) LTD.

Vickers Limited have floated a subsidiary company—Vickers (Aviation) Limited—to take over their Works at Weybridge, Surrey, for the manufacture of aircraft, aircraft accessories and equipment. The directors are Sir Robert McLean (Chairman) and Sir Mark Webster Jenkinson, K.B.E., F.C.A. Mr. H. H. Duvall, A.C.A., is the Secretary.

Harbour Engineering Notes.

POWER GAS FROM LIME KILNS.

Various attempts have from time to time been made to employ the waste heat from lime kilns, but the most successful result obtained so far is the employment of the gases for raising power, as a result of a recent patent and the application of this principle to a small lighting plant. In this particular installation, 2½ cwt. of coke are fired with every ton of limestone. Inside the kiln is placed a retort perforated at the bottom, which forms the only outlet for the gas generated inside the kiln. This retort contains coke which is maintained red hot by the combustion of the fuel inside the kiln proper, and the gas finally drawn off the kiln, through the retort, contains about 30 per cent. carbon monoxide. The gas is subsequently used in a gas engine which drives a dynamo for the generation of current for lighting purposes. One pound of lime is produced for every 1.8 lb. of limestone fired and about 1.25 lb. of fuel, so that the process is an economical one, does not affect the efficiency of the lime-producing process and also turns the waste gas from the kiln to good account.

FRACTIONAL HORSEPOWER MOTORS IN INDUSTRY.

During recent years a very wide demand has sprung up for motors developing one-half, one-quarter, one-sixth and even

B.T.H. Fractional Horse Power Motor driving various machine tools through line shafting.

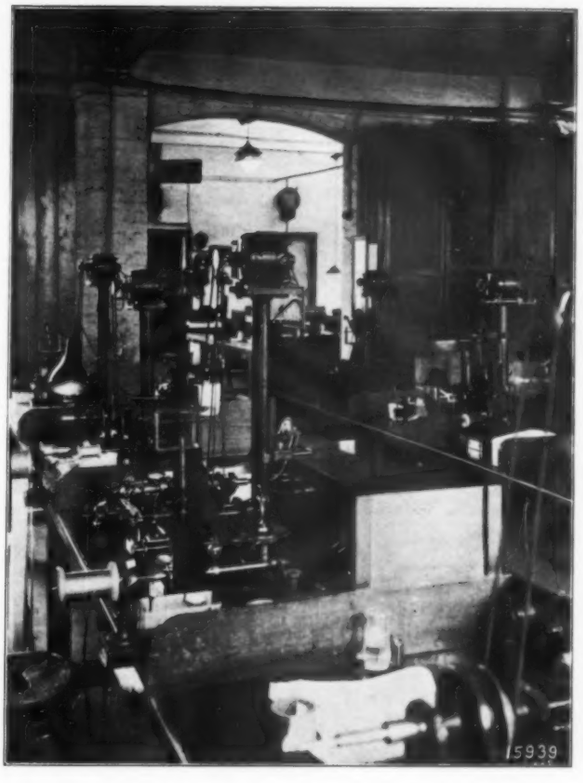
one-eighth horsepower. Apart from their use in domestic establishments, there is an extensive field of application in factories and retail shops, their adoption taking place in ever increasing quantities as their possibilities become more and more appreciated.

These small motors are made for a.c. and d.c. operation, the a.c. motors being made in sizes from ⅓ h.p. up to ¼ h.p., and the d.c. motors in sizes from ⅛ h.p. to ½ h.p. Starting and stopping these motors has been reduced to the utmost simplicity, and is effected in all sizes up to ¼ h.p. by operating an ordinary tumbler switch, as for electric light, and in a large number of instances these motors may be put on the lighting circuits.

The d.c. motors are compound wound and built for working on any standard voltage between 50 and 250. The average speed of these motors is 1,725 r.p.m., though a speed of 1,150 r.p.m. is available for motors of 1/6 h.p. Another feature is that the motors can be built for running in either or both directions, and they can also be used for variable speeds.

The a.c. motors are split-phase, a centrifugal switch being used in the design, which permits the starting winding being cut out automatically as soon as normal running speed is attained. The circuits for which these motors are made are standard voltages between 100 and 250, 25 to 100 cycles, the 25 and 50 cycle motors being built to run at 1,425 r.p.m. Those made for working on other frequencies run at the nearest possible speed to the above figure.

As motors of this type are being used more and more for operating domestic and industrial machinery of standarised dimensions, it is important to the makers of such machinery that motors of the same power for d.c. and a.c. circuits be interchangeable, and B.T.H. fractional h.p. motors of equal power for d.c. and a.c. circuits are interchangeable, although



Coil Winding Machines in the works of Evershed & Vignoles, Ltd. The coils are for the armatures of the "Megger," "Meg," etc.

in the case of a.c. motors for other than 50 cycles, the dimensions are a fraction of an inch wider than for the corresponding d.c. motors. Such a method of standardisation means that every motor is of the uniform size for its horsepower, irrespective of the frequency of the circuit.

It is also of interest to note that these tiny motors have a high starting toque and overload capacity, low temperature rise and other interesting features. The finish is black stove enamel with nickel fittings.

Among the applications of these motors may be mentioned silk winding frames and silk doubling frames, silk warping frames, silk ribbon looms, automatic silk winding spindles, laundry marking machinery, label and patch sewing machinery, boot panel lining machinery, Vulco presses, Roneo duplicating machines, print drying machines, carbonators for soda fountains, Halden photo-copying machines, Hall print drying machines, De Laval oil separators and oxy-acetylene cutting machines. At the works of Evershed and Vignoles, Ltd., these motors are used for chart printing machines, coil winding machines for Megger armatures, machines for rounding off the ends of bearing rollers for the Megger Meg and for other similar purposes.

WELDED STEEL TUBULAR POLES FOR HIGH TENSION TRANSMISSION LINES.

The engineers of the Swiss Federal Railway have lately adopted a new form of tubular pole for carrying their high tension transmission lines. These tubular poles, which are of mild steel, have an oval cross section at the base, gradually decreasing until they terminate in a circular section at the top. Each pole is built up of several separate sections, each section being formed from a single sheet of plate cut to a trapezoid, then pressed into a tube of the desired cross section and welded. Various dimensions are selected for the different poles, though not more than four or five sections are required to build a pole from 50 to 70 ft. high.

At a height of 40 to 60 ft. above the ground level, pressed mild steel plate arms welded to steel shoes are fixed to the pole, and, where the poles are used to carry overhead contact wires for electric railway operation, special arms are fitted for this purpose.

It is claimed that the new method of constructing poles is more efficient that the older lattice type, in that the former are given a shape closely approximating to that theoretically required by bodies of uniform strength, with the result that a stronger pole is available with less actual material used and with a very much simpler outline, which does nothing to destroy the beauty of the Swiss landscape.

So as to minimise the necessity for carrying out repair and maintenance work in the vicinity of the high tension wires, the upper part of each pole is galvanised by the metal spraying process. The remainder of the pole is painted as required, while the hollow inside is treated by a special tar process, and a top cap is fitted which carries the earth line.

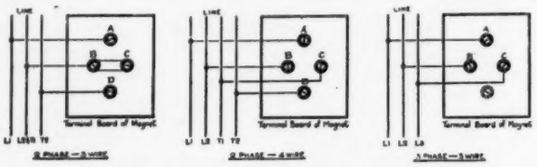
The poles are quickly and cheaply erected, a cement block being poured in a hole in the ground, the pole then being sunk into it and cemented in.

Because of their perfectly smooth exterior, no crevices are provided for the collection of water and other material, so that the poles are inexpensive to maintain. When repainting is required the simple and smooth surface, of course, facilitates this work. After assembly each pole is fixed at the oval end and loaded at the other end to produce a stress of 10 tons per sq. in. on the welded joints.

During the past few months several thousands of these poles have been constructed in the Winterthur shops of Sulzer Bros. for the Swiss Federal Railways, where they are installed for a distance of some 125 miles, carrying 60,000 volt transmission lines.

BRAKE MAGNETS FOR CRANES, HOISTS AND WINCHES.

An improved type of brake magnet for use on polyphase a.c. circuits, suitable for operating mechanical brakes on cranes, hoists, capstans, winhes and similar machinery, and also for any other purpose where it is desired to exert electrically a definite pull through a limited distance, has recently been placed on the market by the British-Thompson-Houston Co.



EXTERNAL CONNECTIONS OF TWO-PHASE (B Q) AND THREE-PHASE (B T) BRAKE MAGNETS.

The construction of these magnets is such that when current is switched on, the solenoid action draws up the plunger and so lifts the weighted lever to which it is coupled, thus relieving the brake wheel of pressure. As soon as the current is switched off, the plunger drops, whereupon the weighted lever immediately lightens up the brake. An air dashpot is provided to minimise the shock when lifting, but this is inoperative in the opposite direction, and therefore does not impede the fall of the weighted lever when the brake is to be applied.

The magnets are arranged for pulling action only. They have protected frames, which are rainproof, suitable for working in the open; but are not watertight, and should not be installed in positions liable to submersion.

The magnet is composed of two essential parts: (1) A frame with a fixed core, windings and dashpot; (2) A plunger with moving core attached. The frame is of cast iron, and is provided with lugs for fixing. In the upper part of the frame are assembled the punchings forming the fixed core and the windings. The sides of the frame are enclosed by two removable sheet iron inspection covers, whilst to the bottom is fitted a cast iron cover carrying a dashpot. This dashpot is adjustable, enabling its action to be regulated.

The plunger, which is attached to the moving core, consists of a steel rod moving in guides in the frame, and is fitted with a piston for working in the dashpot. The plunger cannot be rotated, but two holes are drilled near the bottom at an angle of 90 deg. to each other, either of which may be employed for coupling to the weighted brake lever.

The punchings of the fixed and movable cores are so shaped as to form three legs or poles; and the windings, consisting of three separate coils, are so assembled that each pole is encircled by a coil.

The terminals are enclosed in a cast iron terminal box with a removable inspection cover. The box is drilled at the side so that conduit may be attached in the usual way by means of internal and external nuts.

The magnets are shunt wound. The three coils of the three phase magnets are Y-connected, one end of each coil being connected to one of the three phases. The two phase magnets are so arranged that one set of two coils is connected across one phase and the remaining coil across the other phase.

The magnets are suitable for use in a.c. circuits up to 600 volts, 25 to 60 cycles. They are made in two types: type BQ, which is connected for operation on two-phase circuits; and type BT, for three phase circuits. With the exception of the first size, each type of brake magnet has two ratings; the one designated crane rating, allowing 120 operations per hour, and the other continuous or heavy service rating, which permits of the solenoid being left continuously in circuit, or alternatively, 240 operations per hour. The maximum temperature rise for either rating under these conditions of operation is 40 deg. Cent. The maximum allowable voltage drop from specified voltage is 10 per cent.

When brake magnets are required for operation on circuits having a higher potential than 600 volts between phases, a suitable transformer must be installed to step down the pressure to 600 volts, or under. All such cases should be made the subject of a special inquiry, as a transformer of special design is necessary.

Belfast Harbour Board.

At a meeting of the Belfast Harbour Commissioners, Mr. R. E. Hedman, D.L., the chairman, called the attention of the Commissioners to a statement by Mr. David Barry, O.B.E., of the Dublin Docks Board, with reference to the shed accommodation on the Harbour Estate in Belfast. In the course of his statement, Mr. Barry said at Belfast he found the best shed accommodation he had ever seen at any port. He added that if there had been such accommodation in Dublin—his company, the British and Irish Steam Packet Co.—would have been spared the large outlay which they had been obliged to meet. It was very gratifying, concluded Mr. Herdman, to find that their efforts were appreciated by the general public.

The report of the harbourmaster showed that 265 vessels arrived at the port in the period from the 17th to the 30th June, as follows:—Coastwise and cross-Channel, 240; foreign, 19; non-trading, 6. The total tonnage of vessels which arrived from the 1st January to the 30th June was as follows: Coastwise and cross-Channel, 1,109,879, an increase of 35,145 compared with the corresponding period of 1927; foreign, 288,158, a decrease of 48,120; non-trading, 40,826, an increase of 16,526; total, 1,438,863, an increase of 3,551.

The general manager reported that the tug which is being built for the Board by Messrs. George Brown and Co., Greenock, to replace the " Lagan " was ready for launching, and that it would be necessary for her to be named and registered by the Commissioners.

On the motion of Mr. Garrett, seconded by Sir Thomas Wilson, it was recommended that Mrs. R. E. Herdman be asked if she would consent to the tug being named after her.

The recommendation was adopted, and the chairman said he would like, on behalf of his wife, to thank the members of the Trust for the honour they had done her. Such a proposal meant more to him than if the honour was conferred upon himself.

A gloomy picture of the position of the Port of Newry, formerly one of the most important in Ireland, was drawn at a meeting of the Newry Port and Harbour Board.

The chairman, Mr. F. D. Russell, said the big decrease, particularly in the case of coal, could be attributed largely if not wholly to the dockers' regulations regarding overtime. As a result of the restrictions about overtime, trade that formerly came to Newry was now going to Belfast, Dundalk and Warrenpoint, and unless something were done the position would become very serious. Vessels were being diverted into other ports where they could get more favourable labour conditions. Sea and inland tolls and rates on cargo for the past three months had fallen by £529.

Mr. F. Fisher, J.P. (managing director of Joseph Fisher and Sons, Shipowners), said they could not carry on unless employers and employees came together and made some arrangement. Labour could not realise that Newry was a tidal port, and therefore entitled to different treatment to a port where vessels were not dependent upon tide. Overtime, he said, started in Newry at 1 o'clock on Saturdays, with the result that recently a vessel which arrived at 11 o'clock had to lie over till Monday, as it would not have paid the owners to pay overtime for her discharge. In Belfast there was no overtime paid on three-fourths of the coal imported, and no overtime at all in Warrenpoint.

He added that a proposal that overtime should not start till 6 o'clock on Saturdays and 11 p.m. on other days had been turned down. The restrictions were killing the crushed granite industry and stone sett-making was at an end for the present.

The head and secretary of the Dockers' Union has asked him if he could guarantee that the trade of the port would increase if there was no overtime. He had replied that he could not give such guarantees; but he guaranteed that if the overtime restrictions were not altered the trade they had would gradually fall away. They could never bring back what they had lost.

Further consideration of the matter was adjourned, and in the meantime it was decided to dispense with the men employed on the Board's dredger owing to the serious falling off in the trade of the port.

CHANGES ON THE FYLDE COAST.

Following the removal of the Belfast mail boat service from Fleetwood to Heysham, important administrative changes at the Wyre port are taking place. The harbour section, together with the staff, comes under the supervision of the dock superintendent, whilst the permanent way department is to be placed under the engineer's headquarters at Lancaster. The dredging and surveying departments remain at Fleetwood.

Improvements at the Port of Bombay.

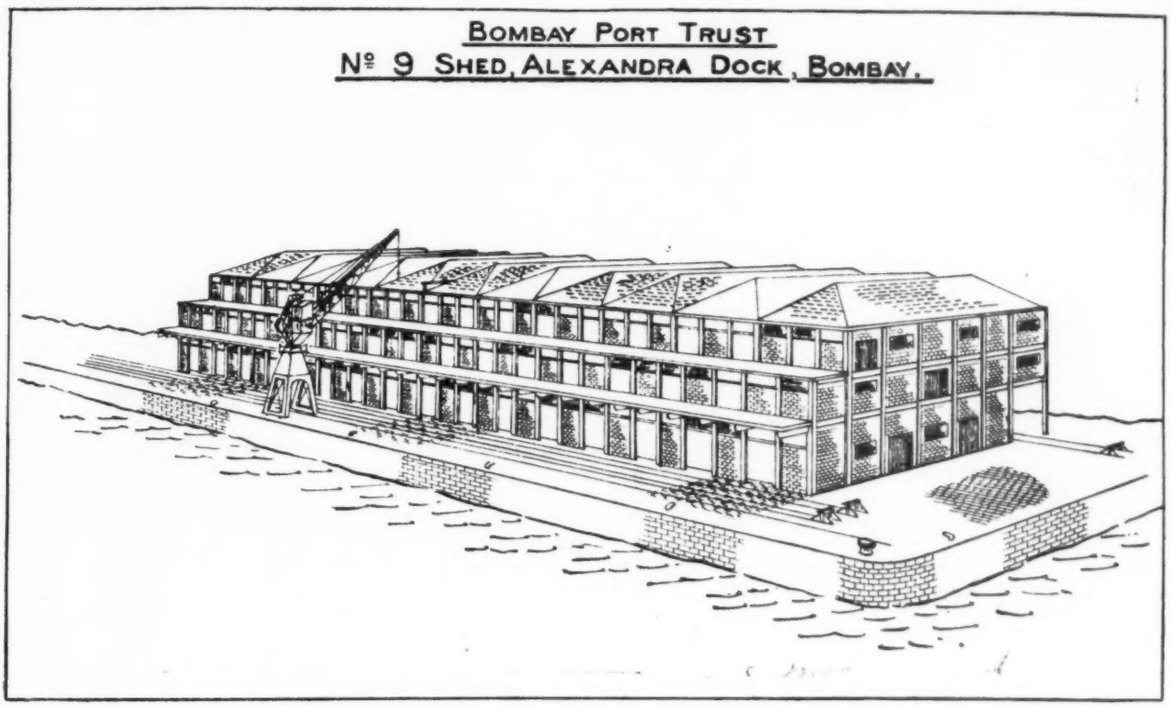
A New Transit Shed and Bunder.

By F. G. CARRON, M.Inst.C.E., Executive Engineer, Bombay Port Trust.

THE work of constructing the Alexandra Dock was commenced in 1904, the foundation stone being laid by His Royal Highness the Prince of Wales (now King George V.) on the 13th of November, 1905. This was actually the first stone laid in the construction of the walls of the docks. All the masonry work in the dock walls was completed in 1914.

In 1909 Messrs. Price Wills and Reeves, who were the contractors for the new dock works also secured the contract for constructing the foundations of sheds Nos. 1, 4, 6, 7, 8, 9, 11 and 12. At the same time the foundations for sheds Nos. 2, 3 and 5 were constructed departmentally, the whole of this work being completed before the end of 1913.

The wharves on which all these sheds are constructed is land reclaimed from the Harbour; so it was necessary in every case to provide piled foundations for the sheds.



GENERAL DESCRIPTION OF THE NEW TRANSIT SHED (No. 9).

The construction of this shed was commenced in January, 1925. It is a three storied shed measuring 396-ft. long by 121-ft. 6-in. wide by 42-ft. high from ground floor to tie beam of roof truss. The floor area available for the storage of goods is approximately:—

	Sq. ft.
Ground floor	39,000
First Floor	47,900
Second floor	42,000
	128,900

In addition to these areas there are galleries running the whole length of the west side of the building. These are 15 feet wide on the 2nd floor and 10 feet wide on the 1st floor and are used for the reception of goods discharged from ships by means of the hydraulic cranes. A railway siding runs the whole length of the building on the east side thus allowing for the direct loading or unloading of goods into or from railway wagons under cover of the first floor of the shed. The ground floor of the shed is laid with a slope of about 1 in 54 from west to east being at a level of 3-ft. 6-in. above the rail level of the siding on the east; from this point it slopes down towards the wharf on the west. Goods on trollies can be run along the floor of the shed right into the railway wagons at any of the 13 door openings provided on the east side.

To facilitate the movement of goods by cart transport two cart roads are constructed on the ground floor. These roads are about 11 feet wide and have a slight fall from the centre of the shed to the wharf on the west and to the level of the railway siding on the east.

The economic handling of goods is provided for by:—

(*i*) five 35 cwt. Hydraulic cranes on the wharf,
(*ii*) one 6 ton Hydraulic crane at the south corner of the wharf,
(*iii*) four 4 ton Hydraulic lifts inside the shed and
(*iv*) four Shoots for the discharge of suitable bag and case cargo from each floor to ground level on the east side of the shed.

DESIGN AND METHOD OF CONSTRUCTION.

As mentioned above, piles had been driven prior to 1913 by the contractors, Messrs. Price Wills and Reeves. These had been arranged in 7 rows, each row containing 34 groups of piles, each group consisting of either 3 or 4 piles; the first row on the west or wharf side having 3 piles in each group, the next 5 rows having 4 piles in each group except that the last group of each of these rows had only 3 piles (to carry the end walls of the shed) and the 7th row counting from the wharf side having 3 piles, the total number of piles was thus 856.

The specification of these piles was as follows:—

"Piles to be of Hill Jarrah, Turpentine or other approved hard wood. They are to be round and have an average diameter of 12-in. with a minimum of 10-in. at the smaller end, to be of the best quality, sound, straight and free from flaws or other defects. Every pile before being driven to be hooped with a strong well fitted wrought iron ring and to be shod with a cast iron shoe fitted with wrought iron straps. The flat bearing at the point of the pile being of not less than 9 sq. in. and the weight of the shoe complete being not less than 28 lbs. The shoe to be well fitted to the pile and secured with suitable spikes. Permanent marks 5 feet apart measuring from the bottom of the timber are to be cut into the pile and figured for the purpose of determining the length that may be driven. All piles to be driven right through the made ground and into the permanent strata for such a depth that the last 6 blows of a one ton monkey with a drop of 6 feet shall not cause the pile to sink more than 2-in. The contractor must satisfy himself by driving a trial pile or otherwise of the length of pile required to comply with the conditions of the previous clause."

The actual length of piles used was from 26 feet to 35 feet and when driven the length of pile which had to be cut off averaged 3-ft. 9-in. After driving the piles in each group the ground was carefully watered and consolidated by ramming; after which a layer of rubble 1 foot in depth was placed as a foundation for a concrete block 5-ft. 3-in. square by 3-ft. high.

Another concrete block measuring 3-ft. square by 1-ft. 6-in. was placed on the top of this as concrete capping to form a bearing block for the steel pillars of the building which it was intended to erect as a two storied shed.

In 1924 the Chief Engineer proposed that the shed at this site should be erected to an improved design which would provide greater accommodation than the older types and would embody several improvements which would make the shed the most efficient in disposing of cargo of all kinds. This new design is the one to which the shed has been erected.

As the groups of piles had been driven to carry pillars spaced at 12 feet centres the long way of the buildings and from 15 to 18 feet apart centre to centre transversely, the new design had to be made o work in with those dimensions. An additional row of 34 groups of reinforced concrete piles, each group having 3 piles, was provided on the east side of the shed. This row is 16 ft. 6 in. centre to centre from the eastern row of timber piles. The piles for this row were 30 ft. long by 11 in. by 11 in. They were driven by a 2 ton steam hammer, the final set being 1-in. in 5 blows with a drop of 18-in. When driven the average length which had to be cut off was approximately 5 ft. These were capped with a reinforced concrete block 6 ft. square by 3-ft. deep.

At the same time, to increase the bearing power of the old timber piled foundations, pits were excavated to uncover each group of piles and remove the old rubble which had been placed under the concrete capping. The concrete capping was then underpinned by placing mass concrete to form a bed 9-ft. square by 2-ft. 6-in. deep under the original concrete cap. This new concrete was reinforced with pieces of 18 lbs. per yard rails placed about 12-in. apart near the underside of the concrete.

The building has been constructed throughout as a steel framed structure with steel troughing filled with concrete forming the upper floors and galleries of the buildings. These floors are designed to carry a super-imposed load of 4 cwt. per square foot.

The walls are of hollow precast concrete blocks 24-in. by 12-in. by 12-in. and 24-in. by 9-in. by 9-in.; the walls are 12-in. thick between ground floor and first floor level and 9-in. thick above first floor level. The hollows in every fourth block of the 12-in. thick walls were filled with concrete as the work of setting the blocks proceeded; this filling in was with four reinforced $\frac{1}{4}$ in. rods. Every fourth block in the 9 in. walls was also filled solid with concrete in such a way as to form a vertical pillar which was reinforced with $\frac{3}{4}$ in. steel rods. All blocks on the exposed west side were filled in solid.

The steel roof is covered with galvanised iron sheets and has Mangalore tiles laid on battens fixed on top of the corrugated iron sheeting.

The building is divided into two parts by a fireproof wall. There are four stairs leading from the ground floor to the second floor, one at either end of the building and two at the centre of the building (one on either side of the fireproof wall).

The risers and treads of the stairs are of precast concrete supported by steel stringers.

STEEL FRAMEWORK.

In February 1925 tenders were invited for supplying and delivering the structural steel work and steel trough flooring. The tender of Messrs. Braithwaite and Co., Engineers, Ltd., Bombay, was accepted in May 1925. The framework was to be of British steel, the troughing of continental manufacture. It was, however, found necessary to substitute British for Continental steel troughing. Subsequently tenders were received for erecting the steel work and troughing and Messrs. Braithwaite and Co. were also successful in being entrusted with this work in November 1925.

The total weight of steel work in the frame and floors of the building is approximately 2,060 tons. About 35,000 rivets were driven at the site.

For the erection of the steel work Messrs. Braithwaite and Co. employed a 10-ton Scotch Derrick Steam Crane mounted on bogies which were placed on temporary tracks running the long way of the building. Erection commenced at the north end of the shed and the crane was hauled along as required by means of winches operating wire ropes through snatch blocks anchored south of the shed. This method of erection was most efficient and economical.

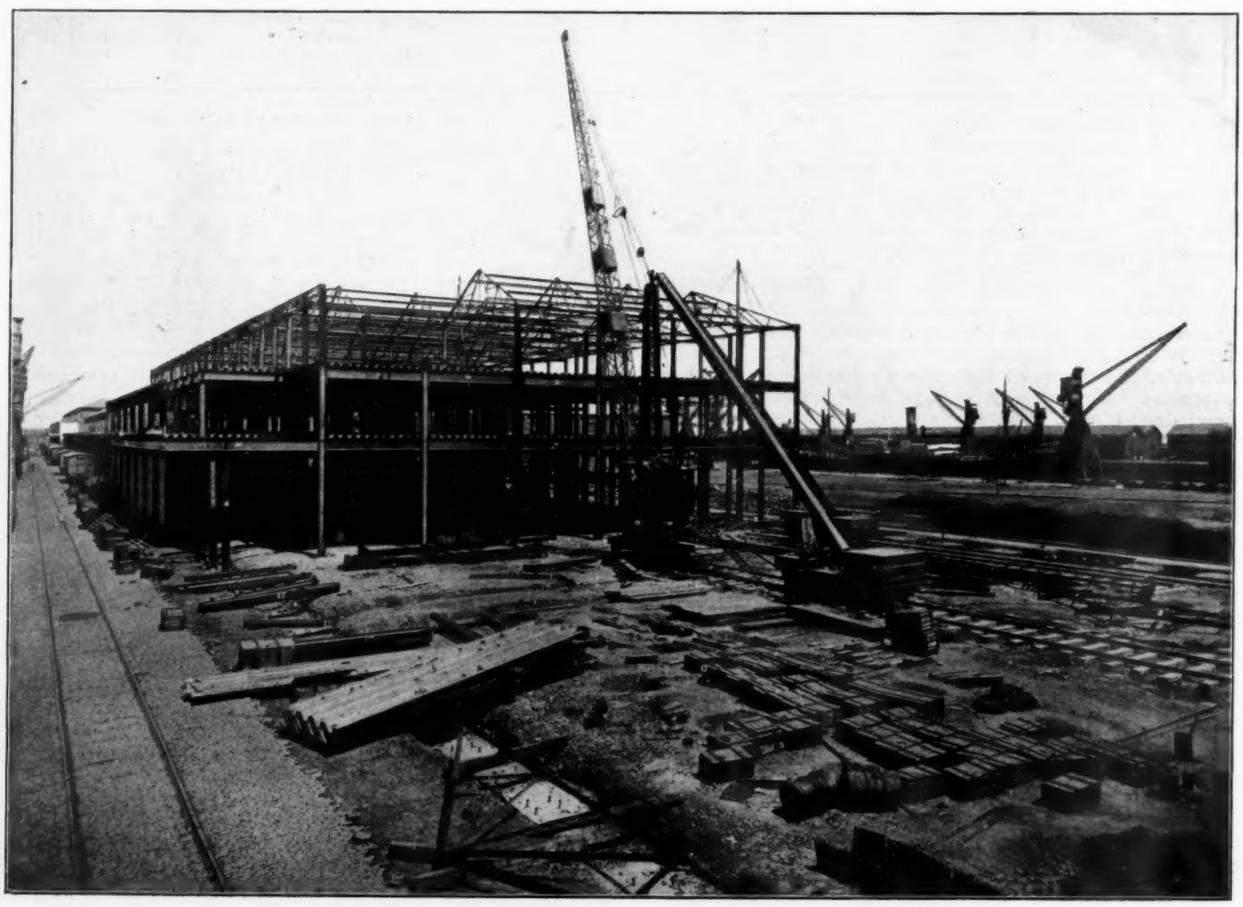
The trough flooring employed was Messrs. Braithwaite and Co.'s double trough section, the depth at centres being 6 in., width 1-ft. 6-in., lap jointed and rivetted with $\frac{3}{4}$-in. rivets at 6-in. pitch. The thickness of the troughing is 5/16-in. The section modulus is 13.44 and the weight in lbs. 19.09 per square foot of horizontal surface covered. The work of erecting all the steel work was completed in May 1926.

HYDRAULIC LIFTS.

The contract for the hydraulic lifts was entrusted to Messrs. Armstrong Whitworth and Co., Ltd., in August 1925. The main features in the specification of the lifts are as follows:—

" Goods lift to be capable of hoisting 4 tons exclusive of weight of hoist through a height of 32-ft. Area of platform to be 14-ft. by 7-ft. The clear height in the cradle to be 7-ft. Lift speed to be 100 feet per minute. The available hydraulic pressure is 750 lbs. per square inch. The lift to be controlled by a hand chain from the cradle.

" The machinery to consist of cast iron hydraulic cylinder and plunger, multiplying sheaves and guide bars for the cross head.

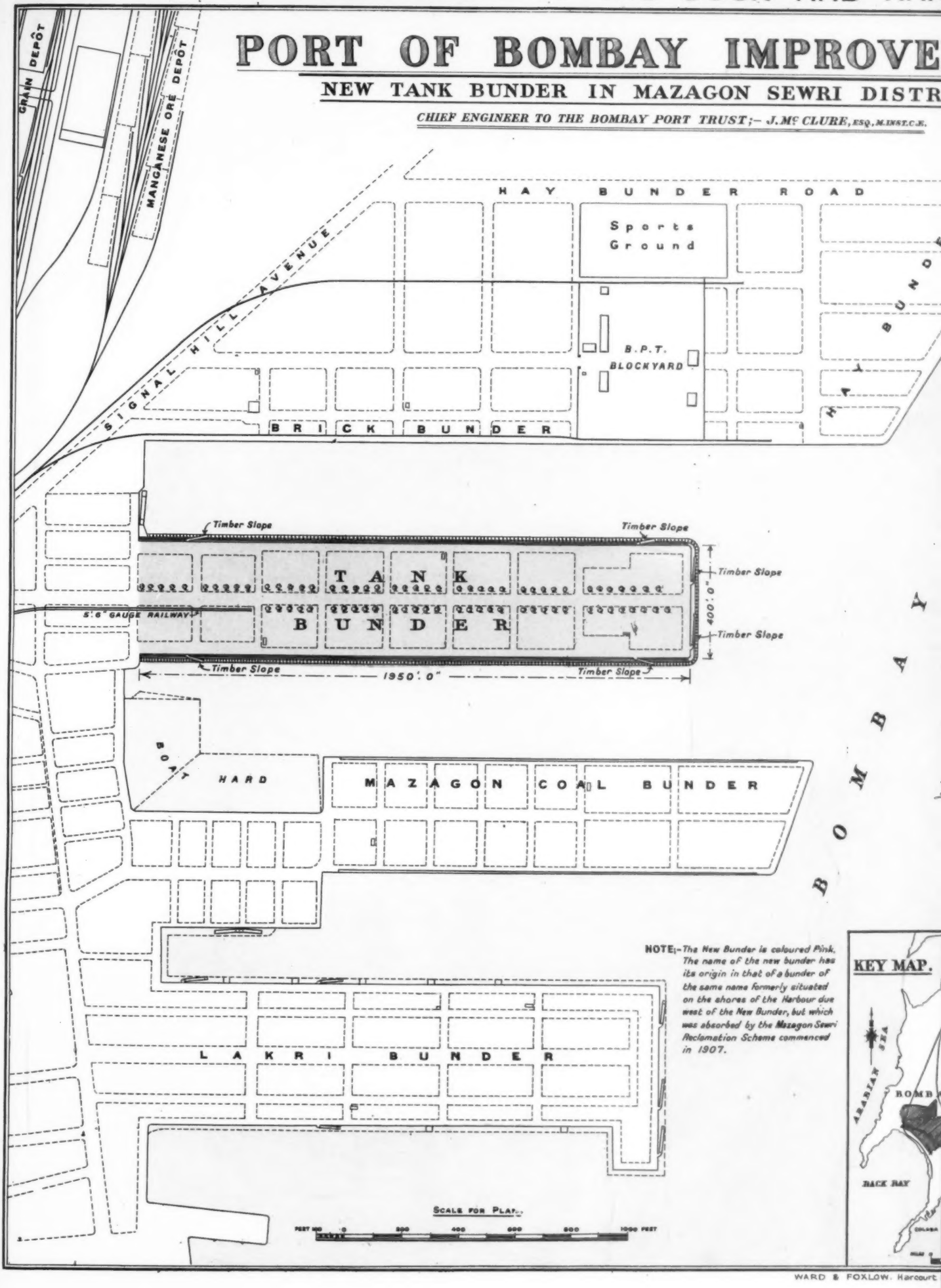


Shed No. 9, Alexandra Dock, Bombay: Steel Framework under Erection.

PORT OF BOMBAY IMPROVE

NEW TANK BUNDER IN MAZAGON SEWRI DISTR

CHIEF ENGINEER TO THE BOMBAY PORT TRUST;— J. Mc CLURE, ESQ., M.INST.C.E.



NOTE:— *The New Bunder is coloured Pink. The name of the new bunder has its origin in that of a bunder of the same name formerly situated on the shores of the Harbour due west of the New Bunder, but which was absorbed by the Mazagon Sewri Reclamation Scheme commenced in 1907.*

WARD & FOXLOW. Harcourt

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...AY IMPROVEMENT.

...MAZAGON SEWRI DISTRICT.

...AY PORT TRUST;– J.Mc CLURE, ESQ., M.INST.C.E.

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NEW BUNDER

BOMBAY HARBOUR

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Timber Slope

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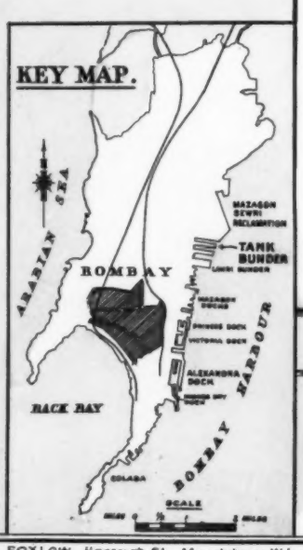
Timber Slope

...BUNDER

NOTE:- The New Bunder is coloured Pink. The name of the new bunder has its origin in that of a bunder of the same name formerly situated on the shores of the Harbour due west of the New Bunder, but which was absorbed by the Mazagon Sewri Reclamation Scheme commenced in 1907.

KEY MAP.



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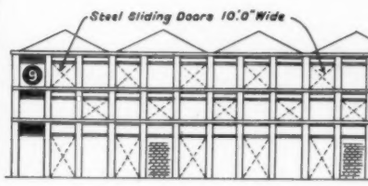

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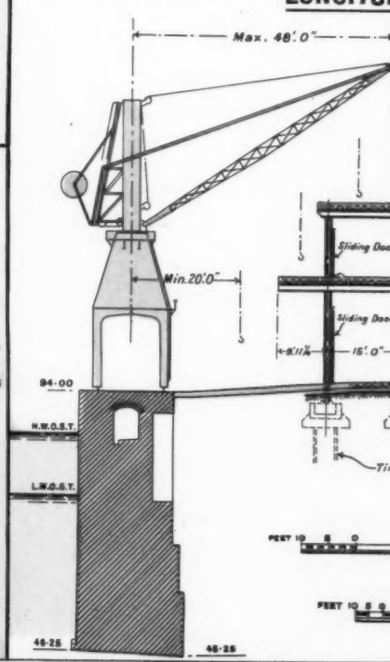
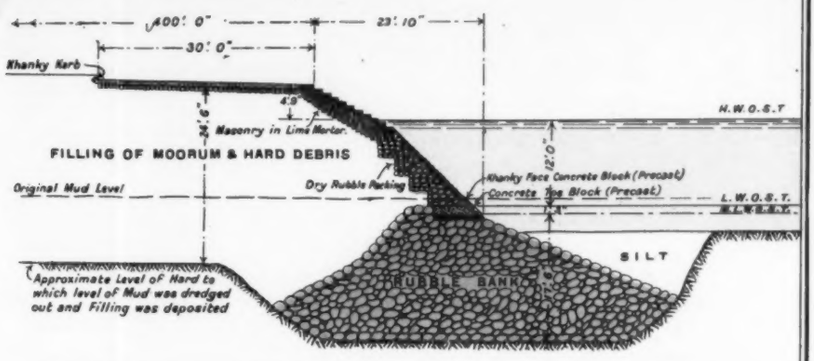


WARD & FOXLOW. Harcourt St. Marylebone. W.1. 5178.

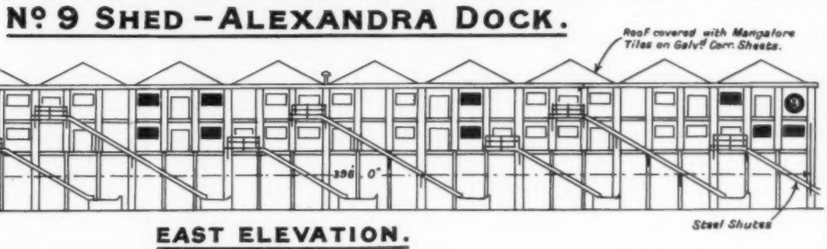


CROSS SECTION OF SOUTH QUAY OF NEW BUNDER AT 1500 LIN. FEET FROM SHORE.

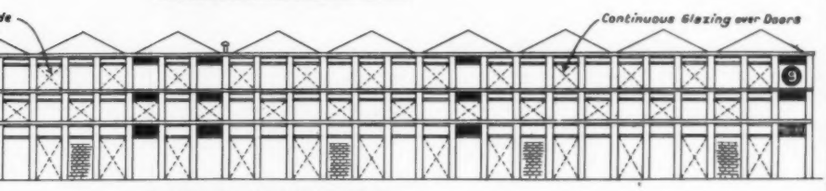
SCALE FOR SECTION.

FEET 10 5 0 10 20 30 40 50 FEET

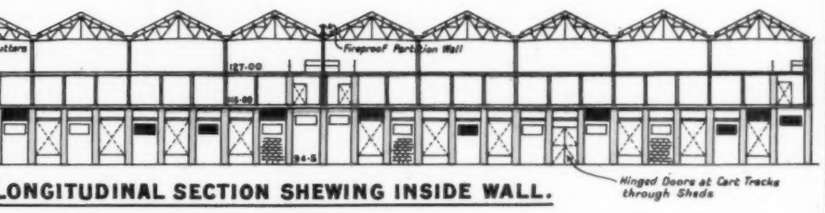
Nº 9 SHED – ALEXANDRA DOCK.



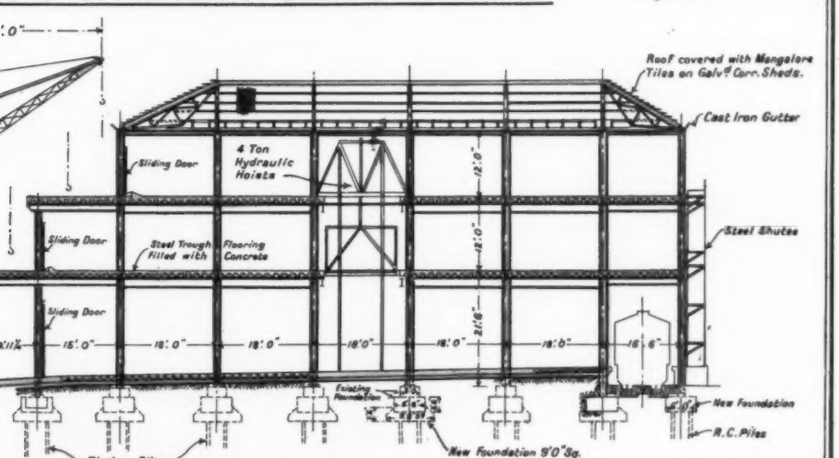
EAST ELEVATION.



WEST ELEVATION.



LONGITUDINAL SECTION SHEWING INSIDE WALL.



CROSS SECTION.

SCALE FOR CROSS SECTION.

10 5 0 10 20 30 40 50 60 70 80 90 FEET

SCALE FOR ELEVATIONS & LONGITUDINAL SECTION.

FEET 10 5 0 10 20 30 40 50 100 150 FEET

Port of Bombay.

Shed No. 9, Alexandra Dock, Bombay. Wharf-side, looking North.

Shed No. 9, Alexandra Dock, Bombay. East Side, looking South.

The cross head guide bars to be fitted with cut off gear to limit the range of travel.

" One lifting rope of best plough steel of 6/37 construction and one iron chain to act as a stand by in case of failure of wire rope together with two sets of overhead pulleys to be provided for lifting cradle. The rope and chain to be capable of taking the whole load due to the cradle and load on it.

" Cast iron balance weights to partially balance the cradle are to be provided together with the necessary overhead sheaves, lifting rope and timber guides.

" Automatic safety gear of the most recent and efficient pattern is to be provided and arranged so that it will come into action immediately in the event of the failure of the lifting rope or chain."

Messrs. Armstrong Whitworth and Co.'s lifts comply with all these requirements.

FLOORS.

The floors of the building are finished with a hard concrete surface. All exposed parts of the upper floors such as the galleries and the areas round door openings are covered with 1-in. of sheet Asphalt composed of:—

	lbs.
Trinidad refined Asphalt	143
Flux	14
Cement	213
Sand	230
Shingle	400
Total	1,000

This material was mixed hot in a special mechanical mixer. It was laid hot on the prepared concrete surface and finished smooth with special tools. The contractors for this work were Messrs. McKenzies, Ltd., Bombay.

RAIN WATER DRAINAGE.

Cast iron gutters 2 ft. wide by 7 in. deep are provided in the valleys between roofs. These are sloped to down pipes on either side of the building; the galleries are also drained into those down pipes. A special cast iron intercepting trough is fitted flush with the floors at all the external sliding doors of the first and second floors of the building; water falling off or blown under the door runs into the troughing and flows from the troughing to the outside drains.

LIGHTING.

The windows are formed of steel sashes glazed in small panes. They are provided for each floor for the whole length of the building on the west side and there is also one window in nearly every panel of the wall on the east side.

Artificial illumination is provided inside by 150 candle power electric lamps, one such lamp being provided for 70 sq. ft. of floor area approximately.

STEEL FRAME PINJRA AND OFFICE ACCOMMODATION.

This has been constructed inside the shed on each floor.

The construction of all concrete work, steel work in pinjras, electric lighting installation and the erection of hydraulic hoists was carried out departmentally under the Chief Engineer, Mr. J. McClure, M.Inst.C.E. The author was Executive Engineer (Construction) during the construction of the work. Mr. J. A.Rolfe was the principal Assistant Engineer and was largely responsible for the detailed studies of the Design.

A NEW BUNDER.

A WHARF FOR COUNTRY CRAFT AND BARGE TRAFFIC.

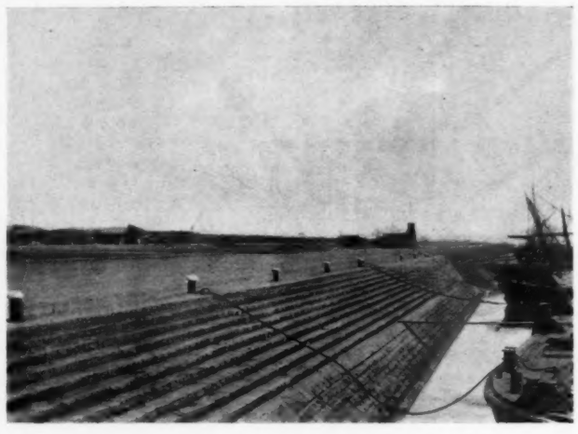
The term " Bunder " is a colloquialism from the vernacular to denote a landing place on the sea face distinct from docks and dock walls, at which shallow draft country craft can lie at anchor and discharge or load cargo. A Bunder usually comprises a strip of wharf front with adjoining land for storage of goods awaiting delivery or shipment.

The combined length of the quays of the Bunders on the shores of Bombay Harbour is approximately 10,000 yards. Accommodation is provided at these Bunders for very large quantities of sea borne coal imported from South Africa or Calcutta in sea going freight ships and discharged overside into lighters in the harbour for use in India or for bunkers, also charcoal, bricks, tiles, timber, stone, lime, hay, sand and shingle, fish, etc., carried in shallow draft Indian country craft which ply between Bombay and the small coast ports in the hinterland. In order to keep abreast of the demands for Bunder accommodation a new Bunder named ' Tank Bunder ' was constructed between the years 1922-25. The name had its origin in that of a Bunder of the same name formerly situated on the shores of the harbour due west of the new Bunder, but which was absorbed by the Mazagon Sewri Reclamation Scheme commenced in 1907, resulting in the addition of 520 acres of land to the Port Trust Estate for the accommodation of trade.

GENERAL DESCRIPTION OF TANK BUNDER.

The Bunder is 1,950 ft. long and 400 ft. wide and provides an area of approximately 18½ acres of land for the accommodation of goods.

N.B.—In the following notes the letters M.L.O.S.T. signify the level of the Mean of the Lowest Ordinary Spring Tides. This is the level to which soundings on charts are reduced. Low Water Ordinary Spring Tides is 2-ft. 3-in. above M.L.O.S.T. High Water Ordinary Spring Tides is 14-ft. 3-in. above M.L.O.S.T.



South Side of Bunder.

DESIGN AND METHOD OF CONSTRUCTION.

The original level of the sea bed was about 5-ft. above M.L.O.S.T. Before undertaking the work, test piles were driven on the proposed line of the rubble mound which was designed to serve as a base for the sloped and stepped walls of the Bunder. The test piles (which were driven with a hand operated machine) showed that the depth of soft silt varied from 13 ft. to 17 ft. The first operation was the dredging of a trench on the line of this rubble mound with the aid of the grab dredgers Stork, Priestman and Flamingo. The trench was dredged to a depth which varied from the level of M.L.O.S.T. to a depth of 18-ft. 6-in. below M.L.O.S.T. The rubble was deposited in barges and the top of the mound was levelled up with 2-in. stone metal to form a level bed. This work was done partly by divers and partly by waders. Iron rails properly levelled were used as screeds to ensure accurate work under water. Reinforced concrete toe blocks which form the base of the masonry embankment was shown in Fig. 1 were carefully placed on the prepared surface of the mound. The course above the toe blocks was built of special khandky-faced concrete blocks 12-in. high.

Another View of the South Side of Bunder.

The trap rock of Bombay is a basalt which is difficult to dress as it is apt to spall with conchoidal fractures. For this reason squared ashlar blocks are expensive. The Bombay masons have for generations used trap blocks roughly dressed only on the face, with a margin of about 2 in. on the beds, and joints square with the face, and the remainder of the block hammer-dressed to approximately the shape of a pyramid. These stones are called khankies.

For the first course above the toe blocks such khankies were taken to the blockyard and placed in a mould, which was then filled with concrete. Stone faced concrete blocks precast in this way can be rapidly set on the top of the toe blocks, and as the periods at which the top of the toe blocks was visible above water occurred only at times of L.W.O.S.T., the use of these blocks enabled the first stage of the construction of the walls to be carried out more rapidly and more economically than would otherwise have been possible. The work of filling in between the walls was commenced from the shore. Most of the filling material was moorum, an earthy material produced

by the weathering and decomposition of inferior trap rock. This was brought by rail from the Port Trust Quarries at Trombay, about 8 miles from the site of the Bunder; other supplies of moorum or broken bricks and debris were obtained from contractors who delivered the material at site by rail, motor lorries or carts. As the work of filling proceeded, the silt overlying the sea bed at the site was pushed forward and removed by dredging.

The walls were gradually built up, and the best filling material was deposited behind them. This consisted of stones, broken bricks, and old lime mortar from houses being demolished in the City of Bombay, this material mixed with moorum becomes very compact, and has a very steep angle of repose.

As shown on the Section Fig. 1, the wall below Mean High Water level was built of dry rubble faced with coarse "khankies." Above that level the walls are stepped, and built in hydraulic lime mortar. These steps are of great assistance to men or women engaged in discharging or loading cargo at any state of the tide.

North Side of Bunder at low water.

In addition to the provision of six ramps to permit of rafts of timber being landed conveniently, approximately one third of the area of the Bunder has been macadamized; other facilities are an ample supply of fresh water, a drainage system, and a railway siding of 5-ft. 6-in. gauge laid as shown on the plan which enables traders to forward goods to inland parts without incurring the expense of road haulage.

The quantities of the principal materials dealt with in constructing 'Tank Bunder' were as follows:—

	Cubic yards.
Silt and mud dredged and removed	527,000
Stone, rubble in mound, and masonry in walls ...	84,400
Filling material, moorum, etc.	825,000

Total length of steps of wall: 8 miles 1 step wide.

The Bunder was designed by Mr. J. McClure, M.Inst.C.E., the Chief Engineer of the Port, and was constructed departmentally by the Construction Branch under Mr. F. G. Carron, M.Inst.C.E., Executive Engineer (Construction).

The Humber and Ouse.

The proposed extension of the King George Dock at Hull by the construction of a south-west "arm" provided for in the original plan, and involving an outlay of not less than half-a-million sterling, has been turned down by the London and North Eastern Railway Company. The intimation was conveyed to a meeting of the Hull Chamber of Commerce and Shipping held on July 2nd in a letter from Mr. George Davidson, Divisional Manager of the Company, in which it was stated that the Directors did not consider such a large expenditure could be justified by any anticipated income in business at the Dock. The decision has been received with a general feeling of disappointment in the city, though it was not entirely unexpected. The grain traders, however, are more hopeful that their request will be acceded to since Mr. Davidson in his letter also wrote that the question of additional grain silo accommodation at the port was engaging the immediate attention of the Board. The departmental officers had some time ago proceeded to consider the matter, and would be ready to report very soon.

The question of the provision of accommodation on the site of the Western Reservation for the import timber trade is still under discussion and is the subject of negotiations between the Hull Corporation who own the land and the London and North Eastern Railway Company who have had an offer of it on a lease. In the bringing of the two parties together the Hull Chamber of Commerce has played a conspicuous part, and the difficulties which had been encountered are now in process of being overcome, and the desires of the timber importers satisfactorily met. It is, however, unlikely that anything can be done to be of service this season, but there will be an ample interval before next season to lay out the land with rails and storage.

The unique facilities in the matter of water transport provided by the Aire and Calder Navigation at Goole have been much to the fore of late, when in the latter part of June official visits were paid, on the invitation of the Directors, by the Yorkshire Section of the Institute of Transport, the Humber Conservancy, the Leeds City Council, the Hull Trinity House and the Hull Chamber of Commerce. The Aire and Calder Navigation is one of the largest and most successful inland waterways in the United Kingdom, and the method adopted in the handling of the coal traffic from South Yorkshire is unlike that employed anywhere else. At Whitley Locks the visitors inspected the compartment-boat system, which is a dominant factor in Goole's coal export trade. These so-called compartment-boats are square steel or iron tanks each capable of holding 40 tons of coal, and floating train-wise are towed by double-headed tugs. A full load is 19 compartments holding approximately 800 tons of coal, the train extending nearly 450 ft. and proceeding snake-like along the canal. The reason for the double head of the tug, it may be explained, is because a ladened compartment boat, by its suction, renders inoperative a rudder, and therefore the easy turns of the canal have to be negotiated by making one of the heads of the tug moveable. Although a speed limit is imposed so that no wash shall affect the canal banks, it is possible from the collieries near at hand to load coal in a morning and get it to Goole and transferred into a sea-going steamer by evening. During the journey, a distance of 20 miles, only two locks—at Whitley and Pollington—had to be negotiated and at each there is a drop of six feet, this indicating the flat character of the country through which the canal passes. The process of lifting a compartment-boat from the water by hydraulic hoist, tipping its contents into the steamer and returning the boat to the water occupied from three to five minutes. The beginning of the compartment-boats was the idea of a former engineer and manager of the Aire and Calder Navigation (the late Mr. Bartholomew). During 1927 the amount of coal shipped at Goole was 1,500,000 tons and of that nearly 900,000 tons was brought from the collieries in these compartment-boats. The system of waterways which concentrates at Goole extends via the River Ouse and the River Trent to various parts of Yorkshire, including Leeds, Bradford, Halifax, Wakefield, Huddersfield, Barnsley, Rotherham and Sheffield, and further afield to Newark, Nottingham, Chesterfield, Lincoln, Gainsborough, Derby, Burton, Leicester, Loughborough and Boston. A project which some day may come to fruition is the cutting of a canal or waterway from Leeds to the Ouse near Goole large and wide enough to permit the ocean-going steamers, which now do not proceed further than Goole, steaming right up to Leeds. It has often been talked about and is certainly within the region of practical politics.

In addition to the Aire and Calder Navigation there is, of course, the Trent Navigation, which is responsible for a fleet of boats which sail between Hull and Goole and Nottingham. Lieut.-Col. F. Rayner, D.S.O., the engineer and general manager of the Trent Navigation Company, has just resigned his position, and it is officially announced that he is succeeded by Mr. S. F. Bagshaw, the secretary, who in future will be both general manager and secretary. Col. Rayner has been appointed a director and will act in an advisory capacity. He has been with the Company nearly 40 years and has been responsible for a good deal of the constructive work in connection with the Corporation of Nottingham's scheme of building locks and making the waterway capable of carrying larger-sized river-craft employed between Hull, Newark and Nottingham.

Operations have been commenced to carry out a scheme of extensions at the St. Andrew's Dock at Hull, the ultimate cost of which is estimated at approximately £100,000. This particular dock is reserved for the fishing industry and what is now proposed is the enlargement of the Iceland market or stage. The market which extends over 1,400 ft. along the quay is to be widened about 30 ft. over its entire length, and new offices and stores constructed. The need of extra accommodation has been felt for some time past, but the times have been difficult for new capital expenditure, and the scheme has thus been delayed until now. The work is being carried out by the London and North Eastern Railway Co. themselves and will extend over a period of two years, being suspended during the busy part of the season. The widening of the stage will carry the market further out into the present roadway. This will involve the diversion of the railway lines, to which it is proposed to add an additional set, making three sets in all, which will greatly facilitate the dispatch of the express fish trains.

Future of Dublin Port.

Ports and Harbours Tribunal Inquiry.

Before the Irish Free State Ports and Harbours Tribunal in Dublin last month, Mr. P. J. Lawrence, chairman of the Dublin Port and Docks Board, declared that a large expenditure had been involved in bringing the Port of Dublin to its present position. Actual results had proved that every penny expended had been justified.

JURISDICTION OF PORT BOARD.

Mr. E. H. Bailey, Secretary to the Board, Collector of Port Dues, and Supervisor of the Customs House Docks, stated that the jurisdiction of the Board extended from Balbriggan in the North to Dalkey in the South, with the exception of Kingstown Harbour. The quay walls of the River Liffey were under the control of the Board.

Replying to Mr. H. B. O'Hanlon, solicitor, chairman of the Tribunal, Mr. Bailey said that a committee of the Dail recommended that Butt Bridge should be rebuilt and that another bridge, a transporter bridge, be built lower down the river opposite Guild Street. The rate for the construction and maintenance of the bridge would be levied: two-thirds on the city and one-third on the County of Dublin. The proposed transporter bridge would not interfere with shipping, and that was why it was decided on. A fixed bridge, even if there was an opening in it, would not be convenient. When it was opened to let a vessel pass it would hold up ordinary traffic. The police, who are the traffic authorities, desired that traffic should be diverted from the centre of the city.

Mr. Bailey went on to say that there are forty salaried members of the staff, and the total salaries were about £18,000 per annum. The office staff was recruited by public examination, which was conducted by Mr. L. E. O'Carroll, head of the Dublin Technical School.

REVENUE OF THE PORT.

The revenue of the port, under the Act of 1869, was entirely derived from vessels. Now it had gone off ships to goods. The dues on goods were at the rate of 100 per cent. of the schedule: on overseas trade 10d. per ton and cross-Channel 6½d. per ton. The rate on goods was passed on to consumers. So far as the dues on goods were concerned, Dublin and Belfast were the same. For foreign ships Belfast charged 1s., as against 10½d. in Dublin; and Belfast charged cross-Channel vessels 6d. per ton on the net register. In Dublin the total sum paid by a ship of 500 tons would be £6 15s., with Corporation dues extra. These worked out at 5s. a ship for a first trip and 4s. for each subsequent trip. The dues paid to the Corporation in the nature of slippage, anchorage, chapter, guild, Lord Mayor's fee, and water bailiff's fee amounted to £2,000 a year.

Mr. Ignatius Rice, Law Agent of the Dublin Corporation, in connection with these dues pointed out that the Corporation had to maintain the streets leading to the docks. These carried a lot of heavy raffic. The dues were based on the ownership by the Corporation of the bed and soil of the river. The Corporation, he said, was the landlord of all land on either side of the river. Mr. Rice went on to say that the Corporation was the landlord of the river banks from Kingsbridge to the mouth of the river, and referred to two law cases in the last century when Corporation claims to dues were upheld.

TONNAGE AT DUBLIN.

Mr. Bailey, resuming his evidence, stated that out of the total tonnage of 546,000 landed in Dublin during the first three months of this year, a total of 90,000 tons had been brought in nine ships owned in the Irish Free State. The total value of the rateable property of the Corporation was £8,468.

Only the north side quays were connected with the railways, but the entire port ought to be connected. The Port and Docks Board had nothing to do with the canals, on which, said Mr. Bailey, there was considerable traffic.

Grain discharges from vessels in Dublin was at the rate of 450 tons a day; in Belfast it was 500 tons a day. At Dublin port a vessel of 9,000 tons would take about twenty days to discharge. He did not know why there was such a difference.

The chairman of the Tribunal (Mr. H. B. O'Hanlon) said he knew of other ports where such a vessel would be discharged in ten days.

RATES OF DISCHARGE.

Mr. Bailey said he knew no reason why 450 tons was the limit as regards grain discharges. The Board had discharged barley for Messrs. Guinness at an average of 800 tons per day. He understood that the grain elevator at the port was not used because of an objection on the part of labour. There was an arrangement between traders and shippers that labour must discharge 450 tons per day. It was not labour that was at fault for the small discharge.

Certain undeveloped lands within the harbour were let by the Board on lease for a term of 99 years. The last letting was made at a rent of £25 per acre. Back lots were let at a lower rate than front ones. The Board reserved the power to resume possession by compensating the tenant.

In the allocation of berths at the quays and the letting of sheds, there was only the implied contract that firms in occupation would not be disturbed except for good reason. There was an annual charge on the barges of Messrs. Guinness that used the river. Mr. Bailey further stated that since 1912 the Port and Docks Board had reclaimed land to the extent of £91,324, and for that they were in receipt roughly of £4,000 per annum in rentals.

In reply to Mr. Dockrell, K.C., for the Dublin Port and Docks Board, Mr. Rice stated that Messrs. Guinness were paying rent to the Corporation for their wharves.

EVIDENCE OF THE ENGINEER.

Mr. Joseph Mallagh, engineer to the Dublin Port and Docks Board, in the course of his evidence said that in regard to incoming large passenger steamers, Dublin was no worse off than Liverpool or Southampton, where passengers could be landed direct on the quays only at very low water. There was urgent need for bringing the survey of Dublin Port and Bay up-to-date. The present tendency, he said, was to standardise cargo vessels at a length of from 500 to 550 ft., and the Panama Canal draught of not more than 40 ft. They could get a high water depth of 36 ft. in the Liffey without much trouble. In his opinion, the future of the Atlantic cargo trade would be altogether in the direction of parcels, and the owners of vessels must be able to send their ships into any port pretending to be first-class. Such a port, as Dublin could undoubtedly be made, would have to provide the very best equipment for the new development of shipping.

ATTRACTING TRADE.

A modern essential for attracting trade to a port was a quick discharge and turn-round. Shipowners would patronise a port where the conditions of discharge were such that they would be able to put in an extra voyage a year. A step in the right direction for the development of the port of Dublin was the making of its capitalisation a Trust Stock, but he held that such a public body should be in a position to exercise its borrowing powers without the necessity of having to specify the works for which the money was required.

He thought that, with ships getting larger, as far as overseas trade was concerned, the Port of Dublin would serve the greater part, if not the whole, of the Free State. There should be one port to deal with the whole of the North Atlantic trade. Dublin was naturally that port. The future of the smaller ports must depend on re-export from Dublin.

Water transport was getting cheaper daily, and in his opinion that would ultimately result in the overseas trade being centred in Dublin, with the smaller harbours being used by the smaller ships. These would come to Dublin, be loaded alongside larger ships, and then distribute their cargo at Irish ports. The trade in wheat and maize was carried on from Dublin in that way not long ago. It was lost to Liverpool and Belfast, largely, he thought, because Dublin could not offer shippers a quick turn-round.

MAKING DUBLIN A "FREE PORT."

Redistribution could be effected on this principle, said Mr. Mallagh, by setting up Dublin as a "free port": that is, a Customs free port. The tolls and charges on ships and goods entering that free port would be the same as at present, but there would be no collection of Customs' duties.

"A free port," continued Mr. Mallagh, "may be defined as an isolated, enclosed and policed area, within, or adjacent to, a port of entry without a resident population and furnished with all the necessary machinery for landing, loading and unloading cargo, supplied with fuel, ships' stores, means of reblending or assembling of part manufactured goods and re-shipping them, or sending them across a land Customs frontier. It simply means that the area will be outside the control of Customs officials and that anything done within its bounds can be done as freely as if the goods were aboard ship on the high seas."

In this way, imported goods would remain duty free until there was a definite market for them. If Dublin could guarantee a quicker despatch than any other port, shipowners would flock to it, and ultimately they could afford to charge a lower freightage.

The revenue from Customs duties would remain as at present. The setting up of such a free port, he said, would be a matter for the national resources, because the first cost would probably run into millions.

PROPOSED TRANSPORTER BRIDGE.

In the course of further evidence, Mr. Mallagh discussed the proposed new transporter bridge across the Liffey. This bridge, he said, would have two carriages, whereas all other such bridges in any part of the world have only one. The estimated cost was £165,000, and the passage time across the river would be less than one minute. Speaking generally, he was satisfied with the facilities offered to ships at the Port of Dublin, but they might have additional cranes, and might also introduce

mechanical devices for the loading and unloading of ships and the handling of cargo in transit sheds. There was the question of the extension of tramways and railway sidings on the North Quays.

Casual labourers, he said, got about three days' work in the week and tried to get a full week's pay for it. The custom of the port was that not more than 450 tons of grain per day should be discharged. That was fixed by the Chamber of Shipping, a British Institution, in conjunction with local traders, and the Port Board had no power to alter it. He thought that the Port Board should get powers to fix what was a reasonable rate of discharge for different classes of vessels. It was wrong to use a ship as a warehouse.

With regard to the maintenance of bridges, Mr. Mallagh said that the surfacing of the bridges was done by the Corporation, and the cost collected from the Port Board out of the Bridge Tax account. Twenty years ago the Board paid about £4,000 for paving O'Connell Bridge roadway, which had not been repaved since.

HARBOUR MASTER'S EVIDENCE.

Captain J. H. Webb, Harbour Master, stated that, in his opinion, the Harbour Master of every important port should hold a Master Mariner's Certificate. The Admiralty Charts of Dublin Bay were not good, and many masters of ships were chary about entering under certain conditions of water. Dublin was a hard port to enter, and there was little good anchorage in the bay. There was a good deal of silting in the river during winter, but no difficulty in dredging it. The mouth of the river and the Alexandra Basin were deep enough for ocean-going steamers. With 980 ft. between the outside lighthouses to 400 ft. at the city end of the navigation there was sufficient width in the river. The works carried out since he came into office in 1912 had improved the port greatly. A port like Dublin should have a reputation for the quick clearance of all cargoes.

At any state of the tide, a vessel drawing up to 18.6 ft. of water could berth in the Liffey with perfect safety. The aim of the Board was to have navigation at high water for vessels drawing 36 ft.

RATE OF DISCHARGE FIXED BY CHARTER PARTY.

Mr. T. R. McCullough, Managing Director, Merchants' Warehousing Co., Dublin, stated that in the charter party for grain vessels the rate of discharge in Dublin is 450 tons a day. Other rates are: Belfast 500; Limerick 400; Cork 450; Waterford 400; Liverpool 700 to 1,000; Hull 500; Bristol 500; Avonmouth 600. Some years ago the shipowners in London and the charterers met and arranged the daily rates of discharge to obviate trouble over the difference of customs at various ports. Labour had nothing to say to the fixing of rates of discharge.

His firm had spent an immense amount of money in the erection of a grain elevator at the North Wall extension; but they never had been able to use it because labour objected. It was constructed to discharge one hundred tons per hour.

Mr. T. W. Hall, who had been a member of the Board for years, said that to take out more than 450 tons of grain per day would entail a great deal of expense for the benefit of shipowners and no one else.

THE CATTLE TRADE.

Senator J. J. Counihan, on behalf of the Irish Cattle Traders' and Exporters' Association, stated that the cattle trade was seriously handicapped by lack of lairage accommodation at the port. Representatives of the shipping companies ruled the Port and Docks Board and had allocated to themselves all available space on the quays. The whole system of election of the Board should be changed. It was wrong that a person in Dublin with a valuation of £250 and no interest in the port should have six votes for election to the Board or be eligible for membership, while persons residing outside the city boundary, who pay thousands of pounds yearly in shipping dues have no vote for, nor can they be elected to the Board. The cattle trade had no confidence in the Port and Docks Board, and were dissatisfied with its present composition.

His Association desired to see six representatives of the six counties around Dublin on the Board, each person to have a direct interest in the trade and commerce of the county. There should be three nominees of the Government with a corresponding reduction in the number of city members. He would reduce the city members from the present seven to the Lord Mayor and one other.

He advocated setting up a public lairage such as at Birkenhead or Merklands, where all stock could be comfortably housed during the period of detention and inspection. He favoured the transfer of the present cattle market to the North Wall. So were all the trade except those with vested interests in the existing site. He believed that the change would mean a saving to the trade of 4s. to 5s. per head.

The site for a public lairage, he said, could be obtained by using some of the present lairages not fully used, and also by taking a piece of ground from the Great Southern Railways.

Mr. John Cassidy, Chairman of the Executive Committee, Cattle Trade Association, said that many cattle were sent from Navan to Glasgow by Belfast, rather than through Dublin, because of the better facilities for getting cattle away at Belfast. In addition there was a direct daily service to Glasgow from Belfast. The Port Board, as a Board, had always given his Association a fair deal, but many of its members were up against them when it was a question of rates and facilities.

THE FRUIT TRADE.

Mr. N. McEvoy, Dublin Manager of Messrs. Connolly, Shaw and Co., brokers and direct fruit importers, stated that if they bought in sufficient quantities there would have to be fruit in the sheds on the quay constantly. Their complaint was that they had to clear in seven days. There were great possibilities in the fruit trade if it could be developed properly.

Mr. Thos. W. Fenwick, general manager of Messrs. Connolly, Shaw and Co.'s Irish business, declared that the Board did not consult his firm with regard to the shed which had cost £4,000 to erect. This was useless for the fruit trade, and its situation at the south side of the river was hopeless.

Mr. David Barry, who was chairman of the Port Board in 1923, stated that he would not have consented to that sum of money being spent if he was not satisfied that it would meet the requirements of Connolly, Shaw and Co. Since he joined it fourteen years ago the policy of the Board had been to do everything calculated to improve the trade of the port. Two of his own company's ships had since discharged fruit into the shed referred to, and everyone was satisfied with the facilities provided. It was more convenient than the Alexandra Basin for the transport of fruit to the market.

DUBLIN CORPORATION POSITION.

Mr. Ignatius Rice, Corporation Law Agent, said that all the Corporation now wanted was to retain possession of the ancient rights to dues at the port which it had held from time immemorial. As a matter of law, the Dublin Port and Docks Act did not take away the rights of the Corporation over the Port of Dublin. The Statute committed to the Port and Docks Board only the care and superintendence of the port.

Mr. Gerald J. Sherlock, Town Clerk, said that the Corporation owned practically all the land of the port and drew rent for it. Their income from port dues arising from ancient legal rights amounted to £2,000 a year. This represented one half-penny in the pound in the rates. Services maintained for the use of ships at the port included the use of the Fire Brigade, for which the citizens paid a rate of fivepence in the pound; the ambulance; the water supply; and the maintenance of the roadways near the docks. The Corporation also maintained the quay walls and the bridges, the passenger ferry boats, life-buoys, scales and cranes, as well as lesser services.

MEN WHO CAN LOOK AHEAD WANTED.

Mr. David Barry, O.B.E., a member of the Port and Docks Board and Managing Director of the British and Irish Steam Packet Co., subsequently stated that, in his opinion, the present constitution of the Board was satisfactory as long as the City Commissioners remained in power. He was not in favour of port workers having representatives on the Board, because they had not men to represent them who would take a broad and intelligent view of the affairs of the port as a whole. In the event of the Corporation being restored he would say that its only representative should be the Lord Mayor in his ex-officio capacity. A port of national importance like Dublin should be managed by men of experience who could look a hundred years ahead. To extend the representation to election on a popular franchise would mean the ruination of the port. He was against the creation of a Government Department with certain jurisdiction over the administration of harbours and ports.

Mr. Barry went on to say that in 1921 his company had nine ships on the Liverpool route. These made 370 trips and paid £5,539 tonnage dues in Dublin. In 1926 they had seven steamers on the route. These made 422 trips and £10,827 was paid in dues, although the numbers of passengers and live stock carried were substantially the same. The amount paid in dues at Liverpool in 1926 was £12,165, but included charges for shed accommodation which, in Dublin, had been provided by the British and Irish Company themselves at a capital cost of £20,000. One of the reasons for the big increase of dues paid in Dublin was that the British and Irish Company had altered their ships to make them more attractive for passenger traffic. That increased the measurement for tonnage purposes. In Belfast the net tonnage rate was 6d., and in Dublin 6½d. The shed accommodation in Belfast, he said, was the finest in Great Britain or Ireland.

REDUCTION IN CROSS-CHANNEL RATES NEEDED.

In Dublin the cross-Channel trade was carrying the overseas trade on its back. In Liverpool and Glasgow there were preferential rates in favour of coastwise imports as against those from overseas. In return for the preferential dues on Irish produce at Liverpool, which he cited, Mr. Barry thought that the Dublin Port and Docks Board should discriminate in the dues on exports to, and imports from, Great Britain, and so increase the trade in Irish agricultural produce. The new British and Irish boats had been taken by the Department of Agriculture as the standard necessary for cattle carrying vessels

in the future. His personal opinion was that there should be a big reduction in cross-Channel shipping rates to and from Dublin.

The lairages at North Wall, continued Mr. Barry, accommodated over 2,000 cattle and were the finest in the country, while the inspection of cattle was very thorough. Because of the saving in expense brought about by the amalgamation, Dublin had now better sea transport than ever.

The British and Irish Steampacket Co., he said, was an independent Irish Company, registered in Dublin, with its own directors, and was not worked by any other Company. English capital was invested in the Company, but it was absolutely independent. He agreed that if the rate of discharging ships in Dublin was speeded up, freights would go down and the consumer would ultimately benefit. He contended that the overseas trade could stand higher charges than at present. He had no objection to setting up a public lairage except that there was no necessity for it. It was altogether a matter for the cattle trade.

FARMERS' CASE.

Mr. C. F. McLoughlin, Secretary, Co. Dublin Farmers' Association, opposed the suggestion that there should be representatives of the Government on the Port Authority. He thought that the Government or the Minister for Agriculture should be given power to select six representatives of the Board from a panel to be formed by the submission of suitable names by County Councils and organisations identified with agriculture. He urged that cargo rates should favour Irish agricultural produce and should help development of the coastal trade.

Mr. J. Kelly Tighe did not consider a municipal lairage necessary, as 95 per cent. of the cattle exported from Dublin were shipped direct. There was no shipping combine at the Port of Dublin operating against the ordinary trader.

Mr. R. C. Ross, cattle exporter, Dublin, thought it was a necessity for the port that there should be a municipal lairage for housing, feeding and watering cattle, such as that at Glasgow. There was a case for more accommodation for cattle on the Glasgow boats in the " back " season of the year. He admitted that the Burns-Laird line put on extra boats when notice of large arrivals was given.

Mr. James Larkin (Secretary, Irish Workers' Union), also gave evidence.

The members of the Tribunal were: Mr. H. B. O'Hanlon (chairman), Mr. M. Deegan, and Mr. Chas. H. O'Connor, with Mr. H. Baxter (secretary).

THE CHAIRMAN'S EVIDENCE: IMPROVEMENTS IN PROGRESS.

On the 7th July, Mr. P. J. Lawrence, chairman of the Dublin Port and Docks Board, gave evidence. He said that the present constitution of the Board would work out well, but it was felt that a slight modification would help. The types of men required on the Board were those with experience of port work—men who could regularly attend meetings and give close attention to the Board's affairs. This type was not to be found among cattle traders and farmers living a considerable distance from Dublin. As to the facilities provided for the rapid despatch of goods, the Port of Dublin compared favourably with any first-class port elsewhere. During his period of membership the Board had not been ruled by any section. Much of the success associated with the port was due to the industry, ability and efficiency of its chief officials.

Improvements at present being carried out by the Board included work in connection with the 850 ft. of deep water quay at Alexandra Basin at a cost of £85,000; the reclamation of a further 50 acres; the reconstruction and fitting out of a jetty for Vickers, Ltd., at a cost of £8,000; the erection of a new tobacco warehouse at an estimated cost of £20,000; the extension of a crane track on the South Wall; and a new electric crane at a cost of £5,000.

Since 1868, he said, the Board had spent on the port £2,000,000. He favoured the inauguration of a body which might be called the Free State Ports and Harbour Association, on which each port would have representation as well as the Ministry of Industry and Commerce. He favoured the transfer of trade from some of the smaller to the larger ports. Every small port should be considered on its own merits. He agreed with Mr. Mallagh as to the possibilities of providing a " free " port in Dublin. It would be for the Government to find ways and means of financing it, but the management of the " free " port should be entrusted to the Port and Docks Board.

He thought that apart from the interest paid on capital account, the Board should not be liable for income tax. The Board was not a profit-making concern, and the £8,000 now collected by the Government as income tax should be available for port improvements or a reduction of port charges.

WHAT THE DOCKERS THINK.

Mr. James Larkin, who said he represented the majority of the workers at the port, stated that the port had always been worked in the interests of a particular group. In 1925 a shipping company in which he was interested paid £120 demurrage in one month because of the facilities denied them. The nation should take over the port, put technicians under the direction of men of capacity, and work it in the interests of the nation. There was sufficient water for the class of ships coming to Dublin, but the shore facilities were inadequate. He favoured the use of a suction plant for discharging grain, but with certain safeguards for the men whom it would displace. There were 7,000 dockers at the Port of Dublin, but the average number in employment any week was only 3,000.

Notes from Western Ports.

GRAVEL FROM THE RIVER WYRE.

The revival of the industry of obtaining sand and gravel from the River Wyre and transporting it to various parts of the country, has been undertaken by the Fleetwood Sand and Gravel Company, whose new grab dredger has commenced operations in the river bed. The vessel, which is fitted with a grab and is capable of dealing with 450 tons per tide, has been completely overhauled at Glasson Dock. The industry will provide employment for a number of men, both afloat and ashore, and it is expected that, as time goes on, another vessel will be purchased to cope with the trade.

NEW HYDRAULIC SLIPWAY.

One of the most important developments in connection with Wyre Dock since the inauguration of the steam trawler industry has been the opening of the new triple hydraulic slipway, which is reputed to be one of the finest on the western seaboard. The slipway, which is estimated to have cost £25,000, and is the first built for steam trawler work, has been constructed for the railway authorities by Messrs. J. M. Henderson and Co., of Aberdeen, from the design of Mr. A. Henderson, M.I.C.E. The slipway will give accommodation for three vessels, one in the centre and one on either side. Unlike previous systems the side-slipping apparatus is below the level of the slipway railings, and consequently there is no loss in depth of water which arises when side-slipping apparatus is placed on the top of the cradle. Another advantage is that the vessel remains on the cradle during the whole process, and again, when the vessel is blocked up on the side berths, it is well clear of the ground, thus leaving space for work underneath the vessel. When the slipway is in proper working order a vessel can be taken out of the water within three-quarters of an hour.

PUBLIC INSPECTION OF FLEETWOOD DOCKS.

During the Fleetwood Fishery and Allied Trades Exhibition on July 20th and 21st, the whole of the port was on show. The Fleetwood Docks were thrown open to the public from 10 a.m. to 6 p.m. on each day and on Sunday following. There was on view up-to-date steam fishing vessels and all the latest types of trawling devices. On the Fleetwood Fish Market and Dock Estate, visitors were enabled to see displays of fish-curing, net-making, box-making, engineering, fish-by-products, prawn-picking, and many other matters of interest connected with the industry, including a full-size section of a fish room of a trawler, showing how fish are kept at sea in the vessels.

FERRY IMPROVEMENTS AT FLEETWOOD.

Structural alterations which will eventually revolutionise the method of dealing with traffic on the Fleetwood and Knott End ferry have been begun. A bridge of a temporary character is being built at the Fleetwood side of the ferry, and passengers will be able to pass from the steamer direct on to the promenade instead of forming large queues as at present and having to pass through the turnstiles. Ultimately a booking office is to be placed on the Knott End ferry landing stage, and this will lessen by 50 per cent. the volume of traffic which is now dealt with at the Fleetwood side.

Port Dues in Yugoslavia.

The Department of Overseas Trade has received from the Commercial Secretary at Belgrade the following list of official rates of exchange for the payment of port dues in Yugoslavia during the month of July, 1928:—

		Dinars.
1	Gold Napoleon	219.00
1	Pound Sterling	277.20
1	American Dollar	56.80
1	Canadian Dollar	56.50
1	German Mark, gold	13.58
1	Belga	7.94
100	French francs	223.30
100	Italian lira	298.70
100	Dutch florins	2290.50
100	Roumanian leis	34.80
100	Danish crowns	1522.70
100	Swedish crowns	1524.30
100	Norwegian crowns	1521.00
100	Spanish pesetas	938.00
100	Greek drachmas	74.20

Personal enquiries regarding all shipping and transport matters should be made at the City Office of the Department (Shipping and Transport Section), 73, Basinghall Street, London, E.C.2.

American Harbour Personalities.

III.—Lt.-Col. B. C. ALLIN.

Probably one of the fastest growing ports, and one of the newest ports of any magnitude in the United States, is that of Houston, Texas. Ten years ago it would have been hard to find anyone who had known that Houston had deep water connection with the sea, and yet, at the present time, it has risen to a position among the twelve major ports in the United States and has spent many millions in public development and over one hundred million dollars in private terminal development and waterfront industries.

The active management of the Port over this period has been left in the hands of Col. B. C. Allin, who, at the time he left the military service, was appointed Director of the Port of Houston on April 1st, 1919. At that time a channel 25 feet deep had been dredged, connecting with the sea, and the City of Houston had expended three million dollars in the creation of public facilities, but little success had been obtained in procuring the calling of vessels or the movement of cargo through the Port. Practically the entire wharves existing at that time were taken up with the storage of Government military equipment, such as airplanes, there being no other business in sight for the wharves.

Born in Chicago in 1884, Col. Allin, after attending high school and the University of Chicago, entered the Government service as surveyor and engineer, and spent a period of some five years in the Philippines in survey and exploration work. He also spent several years in railroad engineering work, and in 1916 undertook, with several others, the formation of the regiment of National Guard Engineers of Illinois. Upon the formation of this regiment, in July 1917, he was commissioned captain and placed in command of Company " B " of that regiment, which later became the 108th Engineers. The regiment was mobilised and moved to Camp Logan, at Houston, Texas, for training, at which place, in May 1918, he was transferred to the commanding general's staff and acted as camp engineer from that time until he left the service in 1919. In May 1925 he re-entered the military service as major in command of the First Battalion, 111th Engineers, of the Texas National Guard, later being transferred to command of the First Battalion, and in June 1928 being commissioned Lieutenant Colonel and executive officer of this same regiment.

The development of the Port of Houston presented a continuous front of problems, the nature of which varied as the years passed. At the time of writing, the record of Col. Allin, as chief executive of the Port of Houston, is the greatest in length of service of any chief port executive in the United States and Canada.

The first year was largely consumed in obtaining the removal of the Government equipment from the existing wharves and obtaining the co-operation of the Government in re-dredging the channel to its projected depth. The Government had recently authorized the deepening of the channel to 30 feet and another problem also confronted was that of obtaining permission from many owners of property for the necessary rights of way and easements.

The next problem was one of obtaining business for the Port, and through the co-operation of the Houston cotton interests, it was possible to obtain a nucleus of business, which rapidly crystallized into steady commerce and brought the first of the foreign shipping to the Port. Considerable effort was necessary to round out Houston's commerce, the development of intracoastal business, as well as coastwise business to Atlantic ports being considered of importance as well as deep sea business, which has been developed to almost every country in the world.

In 1922 a reorganization of the port authority legislation was effected whereby, instead of the previous dual authority of the City and also a port district, the development from that time on was carried on actively by the Port District only and Col. Allin, whose capacity had been a dual one previously, was thereafter the executive officer of the Port District alone.

Following this reorganization, the next step was the spending of four million dollars in additional port facilities, which were laid out by the Port Director in 1922, and constructed between that time and 1925 to the extent of 2,100 feet of concrete wharves, a grain elevator of 1,000,000 bushels and considerable railway facilities. Since that time there have been additions totaling some two million dollars more, as well as the provision of a diesel electric fire boat, the first of its kind to be constructed in this country.

In 1923 Col. Allin was instrumental in obtaining the passage of a pilot act, co-ordinating the pilot activities of the Port.

One of the major achievments of the Port of Houston was the creation of the public belt railroad to serve the waterfront, units having been built from time to time until at the present time the public ownership consists of over fifty miles of railroad trackage and the acquisition of further rights of way is being actively prosecuted. The connection of these railroad facilities with the new public wharf facilities above mentioned was developed in a unique manner through the introduction of saw-tooth sheds and spur tracks, which was developed by Col. Allin after considerable study of the port switching problem, and patented by him in 1923.

The operation of the railroad facilities, after considerable negotiation extending over several years, was put in the hands of an association, the Port district and all of the railroads entering the City of Houston being parties to it, the operation being done by the railroads at cost and non-discriminatory service thus obtained for the entire waterfront on an efficient basis.

Col. Allin, in addition to his duty as Director of the Port, is also Secretary of the Port District Commission, and furthermore is Secretary of the Board of Control of the Port Terminal Railroad Association, which operates the public belt railroad.

Col. Allin has been interested in furthering other phases of development at the Port and is Chairman of the Board of Trustees of the Seamen's Institute, which looks after the welfare of all visiting seamen.

Lt.-Col. B. C. Allin, Port of Houston, Texas.

The policy of the Port district has been to encourage private terminals and several of considerable magnitude have developed, thus enabling the business of the Port to grow by leaps and bounds without a corresponding expenditure of public monies.

The graphic story of the growth of the Port of Houston can in nowise be better told than by the following statement of the tonnage which has been handled through it for over a period of eight years.

Year.	Tons cargo handled.
1920	1,210,204
1921	2,837,349
1922	3,365,635
1923	4,795,324
1924	7,094,294
1925	9,747,122
1926	10,576,236
1927	12,003,497

CANADIAN LAKE VESSEL'S RECORD WHEAT CARGO.

A new grain-carrying record was achieved by the s.s. " Lemoyne," of the Canada Steamship Lines, Ltd., which recently loaded at Fort William, Ontario, no less than 534,300 bushels of wheat, as against the previous largest shipment on the same boat amounting to 518,000 bushels.

The s.s. " Lemoyne " was launched at Midland, Ontario, in 1926 under the name of " Glenmohr," and is the largest craft of her type trading on the Great Lakes, her dimensions being—length, 621 ft.; breadth, 70 ft.; depth, 25 ft.; gross tonnage, 10,480; registered tonage, 7,503. The " Lemoyne " also carried in 1927 the largest cargo of rye on the Great Lakes, amounting to 538,718 bushels. Also in 1926 she achieved a record in mixed grains, having loaded 551,000 bushels. The s.s. " Donnacona," of the same line, holds the oats record, having loaded 760,066 bushels in 1915.

The Prince of Wales at Grimsby.

The Prince of Wales spent a busy day at Grimsby on Thursday, July 19th, when he visited the premier fishing port of the world. The visit was of considerable interest and importance in view of the title which was conferred upon him by His Majesty the King, early this year, of Master of the Merchant Navy and the Fishing Fleets. The Prince spent the greater part of the morning on the Fish Docks where he was given an insight into the magnitude of the fishing industry which forms the port's staple industry. Upon His Royal Highness arriving at the Fish Docks he was presented to Mr. Alf. Bannister, the Chairman of the Grimsby Fishing Vessel Owners Exchange, and Ald. A. J. Knott, J.P., Chairman of the Grimsby Fish Merchants and Fish Curers Association, who piloted him round the Pontoon, as the fish market is called. Before making this tour the Prince was presented to the following by the Rt. Hon. Lord Faringdon. Mr. Alexander Wilson, O.B.E., divisional general manager; Capt. J. Man, C.M.G., O.B.E., R.N., Port Master; Mr. A. C. Gardner, M.I.C.E., M.I.M.E., docks engineer of Grimsby and Immingham. The tour of the Pontoon amidst piles of fish freshly landed from trawlers arriving home that morning, included a visit on board the steam trawler Rolls Royce, belonging to M. Alf Bannister. As soon as the Prince clambered on board he made for the bridge, where he greeted her commander, Skipper J. Grant. The Prince's visit to the vessel was the signal of a tremendous din as the sirens from about two hundred trawlers berthed in both fish docks blasted out a real Grimsby Fish Dock welcome. In response, the Prince pulled the cord operating the whistle of the Rolls Royce. His Royal Highness was tremendously interested in facts concerning the operations of sea-going trawlers which he gleaned from Skipper Grant, and before he left he asked to be shown below where he inspected the crew's quarters. The Prince, before saying goodbye to Dockland, visited the premises of the Great Grimsby Coal, Salt and Tanning Company, and those of the Grimsby Ice Factory, where he saw the process of ice making, afterwards climbing out on to the roof and traversing the narrow plank gangway alongside the ice shute which conveys the ice from the factory to the trawlers waiting in the dock. The next notable function included in the Prince's visit was the opening of the new bridge recently constructed over the Alexander Dock. A description of the bridge was given in the July issue of the *Dock and Harbour Authority*. After cutting the tape across the bridge, the Prince briskly mounted the steps into the control cabin and operating the controls, opened the bridge for the steam tug Marples, belonging to the Railway Company, to pass through. As a memento, the Prince was given the ivory handle taken off the control. This was the gift of the builders of the bridge, Sir Wm. Arrol and Co., Ltd., and was presented by Sir John Hunter, K.B.E., Chairman of the Company.

Department of Industrial and Scientific Research.

Physical and Chemical Survey of the National Coal Resources.

In connection with the Physical and Chemical Survey of the National Coal Resources, which is one of the important aspects of the Fuel Research work of the Department of Scientific and Industrial Research, the Department has recently appointed a Committee to deal with the South Wales Coalfield, with the following constitution:—

Representing the Monmouthshire and South Wales Coal Owners Association, Mr. A. G. Brown, Mr. D. F. Davies, Mr. R. Gibb (junr.), and Mr. W. D. Woolley.

Representing the South Wales Institute of Engineers, Mr. W. O'Connor.

Representing the Geological Survey of Great Britain, Dr. T. Robertson.

Representing the Department of Scientific and Industrial Research, Dr. C. H. Lander (ex officio), Director of Fuel Research, and Dr. F. S. Sinnatt (ex officio), Superintendent of the Physical and Chemical Survey of the National Coal Resources.

Committees are already actively at work in the following areas:—Durham and Northumberland, Lancashire and Cheshire, South Yorkshire, Nottinghamshire and Derbyshire, North Staffordshire and in Scotland.

The object of the Survey is to investigate the characteristics of the various coal seams in the country with a view to their utilisation to the best advantage. Local laboratories are established in each area for the examination of samples and, when necessary, large scale investigations are carried out at H.M. Fuel Research Station or elsewhere.

The work of each committee is to advise as to which seams should be investigated, to recommend what large scale work should be undertaken and to bring to the Department's notice any problems of particular local interest which may require investigation.

Launch of the "Dayspring."

New Twin-screw Buoyage and Survey Vessel for Nigeria.

The twin screw buoyage and survey vessel Dayspring, which has been built to the order of the Crown Agents for the Colonies for the Government of Nigeria, by Sir W. G. Armstrong Whitworth and Co., was launched from their shipyard on June 30th.

The launching ceremony was gracefully performed by Mrs. Hughes, wife of Captain R. H. W. Hughes, C.B., C.M.G., etc., R.N.R. (Director of Marine).

The vessel is to be delivered at Lagos, Nigeria, and her principal dimensions are:—Length on water line, 190-ft.; breadth, 36-ft.; depth moulded 18-ft. 6-in.; draft moulded, 12-ft.

The vessel is intended for buoyage and survey work and is specially constructed for this purpose.

The buoys to be handled weigh 12 tons and they are moored with 2½-in. cables with 3 ton sinkers and the vessel will be employed in lifting and breaking out these buoys and sinkers in rough water; the vessel and her lifting gear having been designed to meet the heavy strains produced by service of this nature.

Water ballast tanks on the cellular double bottom system are fitted, and Nos. 1 and 2 tanks are divided fore and aft to form port and starboard trimming tanks. Two fresh water tanks are fitted in the after part of the hold, each of a capacity of 50 tons.

The vessel is fitted with a special winch with a cylindrical barrel grooved to take a 4½ wire, the barrel being three feet in diameter, and fitted with clutch and strong screw down hand brake and 18-in. diameter warping ends fitted with clutches and screw down brakes. This winch is capable of exerting a pull from the barrel of 20 tons on a single wire and of taking a working strain of 30 tons. Special strengthening is fitted to the deck in way of this winch.

Two steam winches are also fitted in suitable positions on the main deck forward for lifting 20 ton weights on derricks. A powerful steam windlass is fitted on the main deck forward with engine on fore peak flat below for working the two stockless anchors only. Four 8-in. by 8-in. capstans are fitted on the main deck, two being placed amidships and two aft. Each capstan is capable of exerting a 5 tons pull at 70 ft. per minute.

The officers' accommodation is situated at the fore end of the boat deck, whilst on the bridge deck over is fitted the captain's accommodation and chart room, together with a spare cabin and a large cabine de luxe.

The petty officers and six boys are accommodated on the main deck amidships, and adjacent to these spaces is a European galley. The native engine room and deck crews are accommodated aft, on a tween deck flat situated below the main deck. A steering engine is fitted to work direct on the rudder post. A vertical electrically driven refrigerating machine is installed complete with motor, and all necessary fittings, capable of eliminating 18,000 to 19,000 B.T.U.s per hour when working with circulating water at 90 deg. F. and brine at zero. The cold chamber has a capacity of about 300 cubic feet.

The vessel is fitted with a complete electrical installation, current being supplied from two steam driven dynamos fitted in the engine room. The machinery of the vessel consists of two triple expansion inverted direct-acting surface condensing type engines. The condenser is of the Uniflux type and is common to both engines. Two separate bilge and ballast pumps are installed, each capable of discharging 50 tons of water per hour, also a centrifugal high lift fire pump, turbine driven, designed to work at full boiler pressure. Steam is generated in two cylindrical single ended multitubular Marine type boilers, working at a pressure of 180 lbs. per square inch. The building of the vessel has been carried out under the supervision of Messrs. Wells and Rickinson, St. Stephen's House, Westminster, Consulting Engineers, and Engr. Lt. Commander L. R. Rickinson, R.N., has personally interested himself in the work.

CANADA'S CATTLE SHIPMENTS RESUMED.

According to the "Shipping Register" (Montreal) of June 16th, the first shipment of live cattle from Canada for more than a year left Montreal recently for Birkenhead on the s.s. "Manchester Regiment." Over 300 head of cattle were brought by the Canadian Pacific Railway from Calgary to Montreal for export.

The news is regarded by the Department of Agriculture as possibly indicating the revival of Canada's export cattle trade with Great Britain after the lapse of more than twelve months, during which time exports to the United States have shown a rapid increase. The arrival and sale of the cattle will be awaited with interest by Canadian livestock producers.

Book Review.

"The Causes of Failure of Wrought-Iron Chains." Special Report No. 3, H.M. Stationery Office, London; 7s. 6d.

This book gives the results of an investigation conducted at the National Physical Laboratory, under the auspices of the Department of Scientific and Industrial Research. The object was to determine the conditions under which wrought iron chains become liable to sudden failure and the influence of periodical annealing as a restorative treament. It was recognised at the outset that wrought iron chains have failed under circumstances where such factors as gross overloading or defective material could be excluded. The matter is one of interest to most engineers and especially to those seeking means of obviating breakdown of plant and mitigating danger to human life, particularly in the handling of heavy castings in dock workshops and shipbuilding yards where the reliability of chains is a permanent factor in many types of work done.

Some experiments on lengths of new chain employing static tensile overstraining with intermediate and final heat treatment showed that repeated heavy overstraining and low-temperature annealing caused notched bar brittleness in test specimens cut from the sides of links. This notched bar brittleness was not, however, reflected in the behaviour of the chain when tested as a unit under shock conditions, and its real significance is, at present, obscure. In all other respects, low-temperature annealing and normalising were found to be very valuable in removing strain-hardening effects.

Heat-treatment—low-temperature annealing or normalising—has been shown, by causing re-crystallisation in the hardened surface layers, to restore the original ductility. Other causes—more easily identified—of failure of wrought Iron chains in service arise from defects in the material, such as "burnt iron" and "laminated" rod. (The harmful effects of excessive sulphur, phosphorus, or carbon in wrought iron, are well known and have not been further investigated). The progressive deterioration of the welded scarves, due to service shocks and snatches, has also been clearly established.

In another series of experiments the effects of overstraining by heavy shocks were investigated. The chief result was found to be a progressive deterioration of the welded joints. Experiments were then made on chains taken from service of known history. It was found that chains which had been periodically proved and annealed showed no signs of brittleness when tested in the annealed condition. Chains which had not been annealed were very brittle; annealing or normalising removed this brittleness. This brittleness was shown to be due to a "skin" effect, caused by surface hardening, resulting from small impacts. The deleterious effect of this action is undoubtedly the major cause of the production of brittleness in wrought iron chains.

The evidence obtained in the course of the work indicates that, as the result of inter link action, hammering on ground, rattling through hawse pipes, battering on chain wheels, cleaning by rumbling machines (in certain cases), the material of the surface of the link—in some cases only to a very small depth—becomes locally hardened to such an extent that its ductility is practically exhausted. The link surface then consists of a thin, highly brittle case covering a core possessing the ductile properties of best chain iron.

When the link section is subjected to bending strains—particularly those caused by shock conditions—the hardened skin strains elastically and then cracks. This crack is of such a type that very great stress concentration occurs at its root. When the crack reaches the underlying ductile metal, the latter cannot exert its property of ductility because of the prevailing conditions of local constraint and the crack continues its course throughout the entire section of the link, producing a fracture which has an entirely brittle (apparently coarsely crystalline) appearance throughout.

This type of fracture has been encountered during tests on chains drawn from service, and has also been produced on new chain iron bar and new chain links which have been lightly hammered in the laboratory.

Port of Hull.

The Hull Corporation at their meeting on July 5th decided to have a scheme prepared for the provision of a new Victoria Pier and landing stage to take the place of the present construction. The existing accommodation is over 70 years old and for a long time has been deemed inadequate for the purposes of the traffic across the River Humber between Hull and New Holland on the Lincolnshire Bank. A scheme was put forward as recently as 1924 in which the Corporation and the London and North Eastern Railway Company were prepared to act jointly and build a landing stage out to the limit of the Humber Conservancy line and on the fringe of the navigable channel, to cost anything from £350,000 to half-a-million sterling. This met with opposition and chiefly from river-craft interests and firms who have flour and oilseed mills on the River Hull whose fear it was that the proposed new pier, etc., would have the effect of silting up the entrance to the River Hull and make the working of the river craft very difficult and dangerous. The scheme was abandoned, but the urgent need of new accommodation remains. It is considered possible that a modified scheme on a less ambitious scale would meet the situation and avoid the dangers complained of to the Hull navigation. Sir Alfred Gelder, one of the speakers, and a well-known Hull architect, suggested that the new pier, etc., should not cost more than £120,000 and hinted that it could be made self-supporting. Approximately half-a-million passengers use the present ferry service every month in addition to which there are thousands of motor cars and traffic in livestock intended for the Hull markets. On the Lincolnshire side great industrial developments have taken place in recent years and as a Humber tunnel is not at present within the range of probability the next best alternative is to improve the existing means of communication by steam ferry.

Port of Saigon.

The following details and charges for the use of the newly installed cranes at the Port of Saigon, French Cochin China, have appeared in the French journal "L'Opinion," by whose courtesy the particulars are given.

The harbour authorities state that the 1 to 500 ton cranes installed at Khanh-Hoi quay will be available for use on demand at the following provisional charges:—

1.—On week days, the day being counted from 6 a.m. to 6 p.m. and the night from 6 p.m. to 6 a.m., any period under six hours being charged as half a day or half a night as the case may be. Per day, 12.00; half day 8.00; per night 18.00; half night, 12.00 (dollars).

2.—On holidays. Per day, 18.00; half day, 12.00; per night, 27.00; half night, 18.00 (dollars).

Saigon is being modernised, its harbour is to-day seeing the installation of improvements most desired by the shipping companies.

Others are expected, including the creation of a swinging zone which will make the harbour available to ships of every tonnage and all dimensions. "L'Opinion" has recommended this on many occasions and urges that the matter should be included among the most urgent questions on the Agenda of the Harbour Board.

HULL AIR PORT.

At a recent meeting of the council of the Hull Chamber of Commerce it was decided to approach the Postmaster-General regarding the establishment of an air port at Hull for the transmission of mails to the Continent and Northern Europe. The question of congestion in the timber importing trade at the Victoria Dock and a conference of the Hull Corporation with the railway and dock authorities was considered to be satisfactorily progressing.

GREAT LAKES—ST. LAWRENCE WATERWAY.

The approaching completion of the Welland Ship Canal between Lake Erie and Lake Ontario has brought into prominence the necessity of selecting a port at the junction of the St. Lawrence River and canals with the eastern end of Lake Ontario, at which elevators and harbour facilities could be provided in order to permit of the transfer of freight from lake vessels to the smaller craft capable of negotiating the St. Lawrence canals leading to Montreal.

According to an announcement made in the House of Commons at Ottawa recently by the Minister of Public Works, the Canadian Government has now definitely chosen as the new Great Lakes terminal the town of Prescott, Ont., which is the most easterly port above the St. Lawrence rapids. The Minister intimated that the decision was contingent upon satisfactory arrangements being made with the United States in the matter of dredging the International section of the St. Lawrence river channel. He added: "Work will commence in the fall or late summer, as soon as the arrangements are completed." The total estimated cost of the terminal project was stated by the Minister to be in the neighbourhood of $4,000,000, and an item of $1,500,000 has been included in the estimates for expenditure during the current financial year, and has been approved by Parliament.

With the selection of Prescott as the terminal port for Great Lakes shipping, the movement of grain to seaboard will derive the maximum benefit from the 25-mile stretch of the Welland Ship Canal, to be completed in 1930, at a total cost of $120,000,000. The large upper lake freighters of 600 ft. in length, some of them carrying as much as 550,000 bushels of grain, will descend into Lake Ontario. Vessels of 20 ft. draft will be able to go down from Port Arthur and Fort William through to Prescott, when the channel through the Thousand Islands of the St. Lawrence is deepened and straightened. At Prescott the grain will be transferred into smaller vessels, limited to 14 ft. draft, to navigate the existing St. Lawrence canals to Montreal, or will be shipped by rail from the terminal elevators.

Notes from the North.

DOCK BOARD £ s. d.

The Mersey Docks and Harbour Board has issued a comparative statement showing the number and tonnage of vessels which have paid rates to the Board, together with the amount of rates and dues received on vessels and goods for the two years ended July 1st, 1928. The principal figures are:—

TOTAL REVENUE.

1928	£2,764,664
1927	£2,917,690

TOTAL TONNAGE.

1928	40,317,000
1927	41,478,326

WEIGHT OF GOODS.

1928	13,970,000 tons
1927	15,960,000 tons

VESSELS PAYING RATES.

1928	20,078 of 20,158,500 tons
1927	18,592 of 20,739,163 tons

Thus there has been a considerable decline in the revenue of the Board consequent on the falling off in dues. Two factors are responsible for the loss. First of all there was the coal strike. The importations of coal have since entirely disappeared and, therefore, there has been a consequent decrease of tonnage and the dues attached thereto. Secondly, there has been a great falling off in the importations of cotton, and the revenue has suffered in the same way. The position has been eased financially for the Board by the fact that the cost of coal for the port's consumption has fallen, and this can be set off against the loss of dues on coal and cotton importation.

The total number of vessels using the port during 1928 was 20,078 of 20,158,500 tons, an increase of 1,486 in the number of vessels, but a decrease of 580,663 tons. The figures in detail are:—Paying dock tonnage rates were 3,960 foreign vessels of 13,024,344 tons, and 9,152 coastwise vessels of 2,221,777 tons. Paying harbour rates only were 1,871 foreign vessels of 3,491,968 tons, and 5,095 coastwise vessels of 1,420,411 tons. Thus, while there was a falling off in foreign going tonnage of 1,105,331 tons, there is an increase of 524,668 tons in coastwise tonnage. These figures represent the total net register tonnage of vessels paying rates to the Board, inwards or outwards as the case may be. To arrive at the total tonnage which entered and left the Mersey, it is necessary to double the figures. The approximate total tonnage inwards and outwards for the year just ended would, therefore, be 40,317,000 tons, which compares with 41,478,326 tons for the previous year. Rates received on vessels comprise the following:—Dock tonnage rates—foreign £1,349,637, coastwise £68,322; harbour rates only—foreign £60,666, coastwise £8,879. Total tonnage and harbour rates were, therefore, £1,487,504. This amount includes receipts on Conservancy Account viz., £308,616 (decrease £23,852). Graving dock and gridiron rates were £54,548 and dock rent receipts were £10,755. The total rates received on vessels, including the Conservancy Account thus totalled £1,552,808. The rates and dues received on goods are as follows:—Dock rates—inwards foreign £513,309 (decrease £40,697); outwards foreign £140,001 (increase £9,737); coastwise inwards £77 (decrease £3). Town dues—inwards foreign £347,093 (decrease £47,661); outward foreign £148,500 (increase £9,714); inwards coastwise £25,240 (increase £3,480); outwards coastwise £37,632 (increase £5,832). Rates and dues on goods for the year thus amounted to £1,211,856 as against £1,271,453 for 1927. Approximate weight of goods for 1928 on which dues were paid is estimated at 13,970,000 tons, the estimate for the previous year being 15,960,000 tons.

MERSEY TUNNEL NEXT STAGE.

No time has been lost since the completion of the first stage of the Mersey Tunnel work (the construction of upper and lower preliminary headings between Birkenhead and Liverpool) in commencing the second and greatest stage of the work, the construction of a full-sized 44 ft. tunnel, lined with cast-iron rings beneath the bed of the river. In addition to the progress made in the construction of the lengths of full-sized 44 ft. tunnel at the approach headings on both sides of the river, break-up excavations for commencing work on the 44-ft. tunnel under the river have been started at two places, one at a distance of 340 ft. beyond the Liverpool quay wall, and the other at a distance of 740 ft. beyond the Birkenhead quay wall. The excavation of a drainage ditch under the river and the installation of a sub-grade pipe in preparation for constructing the full-sized 44 ft. tunnel under the river have also been pushed forward, so that now that portion of the work is in an advanced stage. On the Birkenhead side, construction continues on the full-sized 44 ft. tunnel under Pacific Road, between the quay wall and the Morpeth Branch Dock shaft. Immediately following the resolution to award Contract No. 2 for the construction of the 44 ft. diameter tunnel between the shaft at Georges Dock, Liverpool, and at Morpeth Branch Dock, Birkenhead, to Messrs. Nuttall & Co., Manchester, preparations to carry out the work were made. The working sites are being cleared for the installation of fresh plant; the necessary plant is under order; orders have been placed for cast-iron lining, bolts and other materials of permanent construction, and actual excavation is under way at two places below the river. The total number of men directly employed on the work is now 430.

SUPERVISION OF WEIGHING INSTRUMENTS.

It is interesting to read from the annual report of the Liverpool Corporation Chief Inspector of Weights and Measures that diligent attention is given to ensure the accuracy of weights and measues used not only in the city area, but on the dock estate. During the past year the department examined for the Mersey Dock and Harbour Board no fewer than 9,004 weights, of which 6,163 were correct and 2,841 required readjusting. As regards weighing instruments, 556 were examined, 499 were proved correct and 57 required readjusting.

£28,800 FOR FERRY IMPROVEMENTS.

Whether or not Egremont Ferry (River Mersey) should be closed or reconstructed at a cost of £28,800 has been again under review by the Wallasey Council. The Ferries Committee recommended that the work of reconstruction should be proceeded with, and that the tender of the Cleveland Bridge and Engineering Company Limited, Darlington, be accepted. This was confirmed by the Council. Twelve months ago the Council decided upon the reconstruction of the Egremont landing stage and pier bridge during the ensuing winter months and to obtain additional expert opinion as to the adequacy of the proposal to spend an estimated amount of £11,250 on the work of reconstruction. The engineers originally engaged by the Ferries Committee condemned the existing arrangement of pontoons for the reason that they could not be taken out for overhaul and repair. When pontoons were approaching the end of their life, the engineers added, and could not be overhauled and repaired, the result might well be sudden failure and even the sinking of the landing stage which they supported. The engineering experts, in their report, emphasised that none of the old pontoons should be used, but that the whole structure including both landing stage and bridge should be scrapped. Opinion is divided as to whether the landing stage and bridge should be reconstructed or Egremont Ferry closed altogether. Those opposed to the expenditure of more money at Egremont emphasise the necessity of proceeding with the new and expensive scheme of reconstruction at Seacombe, and also point to the fact that the existing loan charges on the ferries undertaking are already very high, nearly £2,000 per annum.

The present Egremont stage was built in 1908-9 from designs by the late Mr. J. J. Webster, at a cost of £18,753 19s. 8d. It was stated at the Wallasey Council meeting that the pontoons under the stage at Egremont are now in a very deplorable condition. The rivets are corroded and easily crumble when tapped even gently with a hammer, whilst the metal fittings are faulty and suffer from rust and wear generally. The pontoons are of such construction that they cannot be taken out for inspection or repair.

NEW RIVER FRONTAGE.

It will be remembered that in a recent issue of the *Dock and Harbour Authority*, it was recorded that the Liverpool Corporation was seeking authority to improve the river frontage at Otterspool at a cost of about £100,000. The Ministry of Health has given its sanction to borrow the necessary money, but up to the present the Unemployment Grants Committee has come to no decision in the matter. Meanwhile work of a preliminary character is being undertaken. By means of bore holes the contractors are endeavouring to discover what prospects or what difficulties the foreshore may offer in the way of foundations for the proposed sea wall, and until these tests are concluded it will not be possible to determine whether the work of constructing the river wall will be carried out by the city engineer's staff or will be let out to tender. The scheme involves the construction of a concrete sea wall or promenade extending for about one and a half miles with a temporary embankment at either end, and the reclamation of about 50 acres of foreshore. In the filling in of the low lying land within the embankment debris from the Mersey Tunnel excavations will be utilised. The estimated cost of the work is £99,400, exclusive of the expenditure necessary for laying out the grounds.

LIVERPOOL IMPORT TONNAGE RETURNS.

The volume of Liverpool import trade during the month of May was well maintained, and a gratifying feature was a slight increase in the volume of outward long distance road motor transport. The total of foreign import cargoes at Liverpool and Birkenhead is advised by the Mersey Docks and Harbour Board as 583,990 tons, the clearances in detail being as follows:—By cart, lorry or motor lorry to local destinations, 333,857 tons; by road motor transport to outside districts, 38,171 tons; by overside delivery (grain) 118,930 tons, other cargo 32,077; by flat and barge ex quay, 20,871 tons; by railway wagons loaded on dock estate, 27,227 tons; bulk molassess pumped direct,

12,857 tons. It is interesting to note that 466,279 tons, or 79.8 per cent., were removed from berths with railway facilities, and 117,711, or 20.2 per cent. from berths without railway facilities. The distribution of traffic was as follows:—To local warehouses, factories and mills 428,181 tons (percentage of total 73.3); to railway stations 49,241 (8.5); to foreign and coastal berths 24,648 (4.2); to canal depots 1,222 (0.2); to canals and Upper Mersey 33,885 (5.8); to barges 997 (0.2); and to other destinations 45,816 (7.8). Total 583,990 tons.

WHAT CAN BE DONE IN FOUR DAYS.

Another instance of a steamer's quick turn-round is furnished from Liverpool. The White Star liner "Baltic" arrived in the Mersey from New York on a Wednesday and was berthed in the Gladstone Dock at mid-day. Within a few minutes of docking the hatches were opened and the task of unloading her 2,500 tons of cargo was begun. On completion of this discharge, 3,000 tons of cargo were loaded and men were employed in painting the steamer both internally and externally. Amongst the cargo were three Moth aeroplanes, manufactured by Messrs. A. V. Roe and Co., of Manchester. The "Baltic" sailed for New York on the Saturday.

TENDER ACCEPTED.

The tender of The Ritchie-Atlas Engineering Co., Glasgow, for the supply and delivery of a portable belt conveyor, required to assist in the loading of the s.h.b. "Delta," for the sum of £180 has been accepted by the Health Committee of the Liverpool Corporation. The tender of Messrs. C. Howson and Co., Ltd., Liverpool, for drydocking, overhauling, etc., the s.h.b. "Delta," in accordance with the specification and general conditions proposed by the City Engineer, for the sum of £860, has also been accepted.

MECHANICAL DREDGER FOR THE DEE.

River Dee Drainage Board has purchased from Messrs. Priestman Bros., Ltd., of Hull, a mechanical dredger mounted on caterpillar tracks, for use on the various streams and watercourse which lie within the Board's district. It is anticipated that not only will a great saving in cost of work be effected by the dredger but that as the machine can be used irrespective of the quantity of water in a stream, much work can be carried out that could only be undertaken by manual labour in very dry seasons. Plans and specifications prepared by the Board's executive officer (Capt. G. A. Wright) for the construction of a new sluice in the northern bank of the River Dee opposite Sandycroft Foundry, have been approved. The scheme has received the approval of the engineer of the Dee Conservancy Board.

How traffic is bridged across the River Mersey at Runcorn.

MANX HARBOUR MAINTENANCE.

At Manx Tynwald Court, the Receiver General approved the estimate submitted by the Harbour Commissioners for the maintenance of the harbours, including the Victoria Pier Buildings and the Swing Bridge, Douglas, and the Queen's Pier, Ramsey, amounting to £24,802, and authorised a grant to the Harbour Commissioners of £20,067 towards such maintenance.

Runcorn Bridge across the River Mersey and Manchester Ship Canal. This bridge is heavily used by motor traffic.

The Receiver General said he anticipated that the cost at Ramsey Queen's Pier would soon be considerably reduced. The sand at Peel had been a big question. Last year they spent £3,000 or £4,000 on the dredging, and if they had done all the work that had been contemplated it would have cost £10,000 or £12,000. They had removed about 1,000 tons of sand from the side of the breakwater.

TO FIX THE CHANNEL OF THE RIVER ALT.

Crosby Council contemplates the introduction of a Bill in the next Parliamentary session for the constitution of a Joint Board with powers to fix the River Alt's channel below the flood gates, and to deal with coast erosion. The cost of the work is estimated at £50,000, involving the finding of an annual sum of £5,000 for 20 years to cover repayment and maintenance. The bulk of this money, it is proposed, should be found by the Lancashire County Council, the Crosby Council, and the owners and ratepayers of the district.

MANCHESTER SHIP CANAL IMPROVEMENTS.

Mr. W. E. Thompson, president of the Manchester Chamber of Commerce, speaking at a meeting of the directors of the Chamber, said he had been greatly impressed during an end-to-end inspection of the Manchester Ship Canal. Important developments have been recently completed by the Manchester Ship Canal Co. The special oil docks at Stanlow had made Manchester a good second to London for importing, storing, and distributing petroleum spirit, while the increased facilities for handling cargo and bunkering at Ellesmere Port had created an entirely new situation for the Manchester exporter. The new works at Ellesmere Port and Stanlow cost nearly £500,000. Before the deepening of the lower section, ships using the port were restricted to a draught of 26 ft. 6 ins., and it was the practice for the larger vessels sailing from Manchester to complete their cargoes at another port. For a distance of five miles the canal had been deepened to 30 ft.

The new conditions foreshadow a radical change. They will enable ships to load down to 28 ft. or 28 ft. 6 in. at Ellesmere Port, which means another two or three thousand tons deadweight, and thus complete their cargoes within the confines of one port. This will be at once a convenience to exporters and importers and a saving of time and money to shipowners, who will secure better dispatches and have but one set of port charges to meet, and will afford Manchester the many advantages of being a last port of call. The exporters of fine goods to India, Australia, South America, and the Far East, and elsewhere, who desire to ship them at the last moment before the vessel proceeds to sea, may, if necessary, forward them to Ellesmere Port at no greater cost than to Liverpool or Birkenhead. Increased facilities for other trades, notably coal and chemicals, are also provided.

GROWTH OF PORT OF GARSTON.

The import tonnage at Garston has grown from 716,983 in 1910, to 1,053,873 in 1927. In 1922 Messrs. Elders and Fyffes transferred their banana traffic to Garston, and a berth was allotted for their use in Stalybridge Dock. Later a new service was inaugurated between Garston and the Canaries, necessitating the partial use of a further berth. In connection with this banana trade siding, accommodation is now provided weekly for some 700 special vans. During 1910 ore and timber tonnages formed 83 per cent. of the total Garston traffic; in 1925 the proportion was 61 per cent.; to-day it is 60 per cent., and the present traffic requires more handling and is despatched to a much wider field. As a result of this change in traffic, a certain amount of delay and congestion occurred at Garston last year, but by the improvements and alterations authorised this will be eliminated. The proposed storage area of twenty

acres for timber is ample for requirements. The siding accommodation will accommodate 630 wagons and additional traffic sidings are being provided for 513 wagons and also electric lighting and power for cutting pit props. One of the two existing passenger train lines between Garston Junction and the Docks Station is to be used solely for goods traffic purposes. Other changes are a new siding at Stalybridge Dock, giving independent access to banana traffic berth, additional sidings on high level (Dingle section) for banana vans.

MORE OVERSIDE DELIVERIES.

It is a subject of comment in Liverpool shipping and forwarding circles that nowadays increasing quantities of inward goods are being delivered overside to barges for transfer to warehouses with waterside facilities. Overside deliveries offer pecuniary advantages for consignments of upwards of 50 tons. Where the benefit arises is in dispensing with weighing and porterage on the quay. If goods are shipped overside and no weighing is involved, there is a saving of 90 per cent. in the master porterage charges. Where goods are weighed on the deck of the steamer, there is a saving of 50 per cent. on the usual porterage charges. The writer is informed that in the actual cost of transport between the ship's side and the warehouse, there is very little, if any, difference between barge transport and/or cart or motor transport. The great saving is made in porterage and weighing charges.

DOCK BOARD TENDERS ACCEPTED.

Mersey Docks and Harbour Board has accepted the following tenders: sheet lead (Quirk, Barton and Burns, (St. Helens), Ltd.); electric cable (British Insulated Cables, Ltd.); engine and dock stores, etc. (James Newton and Co., Ltd.); furnace firebars and the purchase of old firebars (Grayson, Rollo and Clover Docks, Ltd.); rope, etc. (Garnock Bibby and Co. Ltd.); paint, varnish, etc. (J. and W. Wilson, Ltd.); oils, etc. (Taylor and Sons); flags (Roberts and Co.); and brushes, etc. (Wm. Gibson and Son).

A DISTINGUISHED VISITOR.

King Sir Ofori Atta of Akin Abuakwa (Gold Coast) enjoyed himself enormously during his visit to the discharging berths of Elder Dempsters Toxteth Dock, Liverpool, on July 11th. Mr. J. H. Sharrock, managing director (Liverpool) of Messrs. Elder Dempster and Co., Ltd., and Captain G. A. Cotterell, marine superintendent, who received the royal party, explained the different processes through which the cargo is put as it is discharged from the ship's hold. The King smiled with pleasure to see the huge overhead gantry crane swinging ten-ton logs of African mahogany to and fro, and other mechanical vehicles bringing palm kernels. The King inspected cargo handling plant described in the last issue of the "Dock and Harbour Authority."

GUESTS OF MERSEY DOCKS AND HARBOUR BOARD.

Bradford wool manufacturers recently inspected the Liverpool Dock estate from the steam tender "Galatea" at the invitation of the Mersey Docks and Harbour Board. At the Gladstone Docks the visitors disembarked and inspected the exceptional facilities which have been provided at the treble storey sheds for the handling of goods. The visitors were entertained to lunch on board the "Galatea" by Mr. R. D. Holt (chairman) and certain members of the Mersey Docks and Harbour Board.

Recent Legal Decisions.

A case of much interest, especially to all concerned in dock or harbour operations, and also in respect of the general principle involved, was *Oliver v. Saddler and Company*, 1928, S.L.T.366, recently decided by the First Division of the Court of Session. The action was at the instance of the widow of a quay porter who had been killed in the circumstances after narrated against a firm of stevedores.

On arrival of the s.s. "Platon" at Leith, the defenders began their duties as stevedores in the discharge of the ship's cargo, which consisted, *inter alia*, of bags of maize meal. The defenders raised the cargo in lots of six bags from the hold to the steelyard on deck. The bags were held together during transit by means of a rope sling, supplied by the defenders, and they were raised by the ship's derrick to the steelyard. It was the duty of the defenders to give delivery of the cargo to the consignees on the ship's deck, where the responsibility of the shipowners ended.

By the custom of the port the defenders do not unship their slings from the various lots of bags at the steelyard. They permit them to be used by the porters (who are employed and paid by the owners of the cargo) in order to carry the cargo from the steelyard to the shore. The porters, however, decide as to the mode in which they will conduct the work of carrying a cargo ashore. They may themselves carry the cargo in single bags or deliver them ashore by means of a chute. But where the cargo consists of maize meal contained in bags, the practice is for the porters to use the cranes belonging to the Leith Dock Commission. In that case the porters unhook the derrick from the sling containing the six bags at the steelyard and then attach the crane tackle to the sling. Thereafter they signal to the craneman, who raises the bags and swings them ashore by means of the steam crane. The porters then return the slings to the defenders' servants, and they are again used for delivering cargo in a similar way.

The defenders stood in no contractual relation with the porters or with the Leith Dock Commission. The porters pay the crane dues and transfer the cargo from the steelyard to the shore in the manner which they determine and according to directions which they give.

The discharge of the "Platon" proceeded in accordance with this custom. The deceased, John Oliver, was a member of the squad of porters who were engaged in transferring the bags from the steelyard to the quay, and as he was standing on the quay beside the ship and about to receive a set of six bags then being swung ashore by the crane, the sling containing them broke and the bags fell upon him and fatally injured him.

The pursuers case, of course, was that the defenders were negligent, and the trial judge found that there was negligence and the defenders were liable. But the point of interest in the case was not that, but the question whether the defenders owed any duty of care to the deceased at all. It was urged that the defenders owed no duty to the porters, and therefore that they were under no liability to them or their representatives arising in consequence of the defective condition of the sling which they used for work which they had contracted to perform quite independently of the defenders. It was pointed out quite truly that no contractual relationship subsisted between the defenders and the porters, and it was argued that the defenders' duty terminated when they placed the cargo on the steelyard, that they had discharged this duty on the occasion in question, that the risks incident to the transfer of the bags by the crane were risks solely associated with the discharge of the porters' duties, with which defenders could not interfere and for which they had no responsibility.

On the other hand, pursuers counsel maintained the proposition enunciated by the Master of the Rolls in *Heaven v. Pender* (1883), that such relation exists "whenever one person is by circumstances placed in such a position with regard to another that everyone of ordinary sense who did think would at once recognise that if he did not use ordinary care and skill in his own conduct with regard to these circumstances he would cause danger of injury to the person or property of the other." The Master of the Rolls then goes on to say that if that relation exists, a duty arises to use ordinary care to avoid the danger, and when this duty is neglected there arises a cause of action.

The judge of first instance in Oliver's case was of opinion that the circumstances disclosed just such a relationship involving a duty of care as the Master of the Rolls contemplated in the words quoted, and, as already mentioned, he found that the defenders were negligently in breach of this duty. On appeal, however, it was held that the defenders owned no such duty to the porters, and the action was dismissed.

Obviously, this is a narrower view of the relationship of two gangs of workers carrying through a joint operation, and the Lord President who gave the leading opinion significantly observed: "I cannot help feeling that the delicate but, so far as I am concerned, impenetrable line of distinction thus drawn between relationships which do, and others which do not, impose a duty of care is doubtfully just in its application to the present case. But the line has been clearly and authoritatively drawn; and I am reluctantly compelled to conclude that no relationship existed between the stevedore and the deceased in respect of which the law recognises a duty of care as incumbent on the former to the latter."

Apparently the court was of opinion that the question was foreclosed by the decision of the House of Lords in *Caledonian Railway Company v. Warwick* (1897), where, it may be admitted that, it would be difficult to imagine a higher or more valuable practical interest than that which the Caledonian Railway Co. there had (as carriers of coal) in the use of their wagons, which they gave to the Glasgow and South-Western Railway Co., as hauliers employed by the consignee to move them along the latter's private street-railroad to their premises. Indeed, without giving such use, the Caledonian Railway Co. could not have obtained the traffic at all. But the decision turned on the circumstance that the business of the Caledonian Railway Co. was ended when they completed the contract of carriage undertaken by them to the consignor—that is, at the point at which their obligations as carriers under that contract came to an end. The use made of the wagon thereafter was held not to be on their business, but on that of the Glasgow and South-Western Railway Co. as hauliers employed by the consignee, notwithstanding the powerful practical interest which the Caledonian Railway Co. had in that use.

ANOTHER CAR FERRY TO PRINCE EDWARD ISLAND.

An item of $1,000,000 included in the estimates of the Dominion Department of Railways and Canals, to provide for an additional railway car ferry between the mainland of Nova Scotia and Prince Edward Island, has been passed by the Canadian House of Commons.

The Harbour Plan of Chicago.

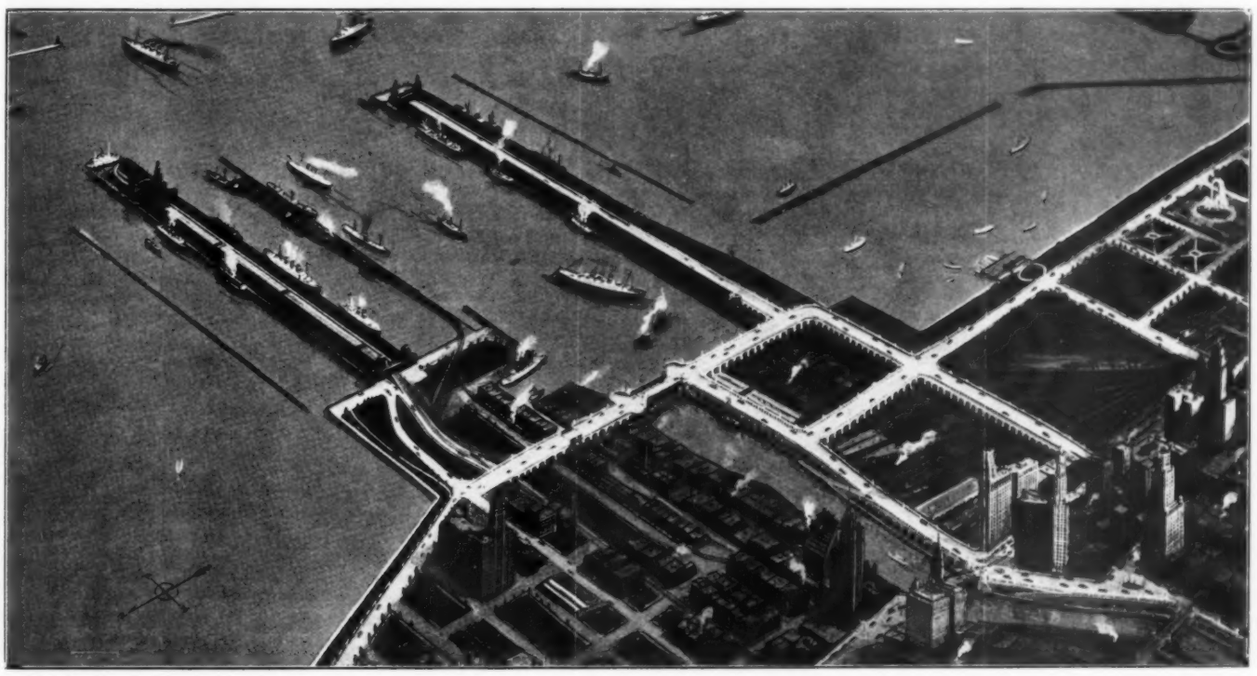
Development of Group of South Michigan Harbours part of Scheme advocated by Independent Committee on Chicago Harbour and Port Survey.

(Continued from page 260.)

EXISTING TERMINAL AND TRANSPORTATION FACILITIES.

RAILROADS.

There are twenty-one independently operated trunk line systems radiating from Chicago in all directions and entering the region on their own tracks, which, either directly or through their subsidiaries, reach forty-three of the forty-eight states in the Union. In addition to these, the Cleveland, Cincinnati, Chicago and St. Louis Railway, which owns no trackage within the region, enters Chicago over the Illinois Central Railroad, and the Chicago, Milwaukee and Gary Railway and Chicago, Terre Haute and Southeastern Railway (both of which lines are operated by the Chicago, Milwaukee and St. Paul Railway) enter the region; the Chicago and Western Indiana Railroad, which handles the dense traffic of various lines entering the Chicago region from as far south as 124th Street, also is not included as a trunk line.



Chicago and Calumet Harbours, Proposed Development Scheme.

As the business centre at Chicago is neared, the railroad lines converge and combine. Just beyond the Elgin, Joilet and Eastern Railway, or on a circle of approximately forty miles radius from the business centre, the Chicago and Northwestern Railway has five different and distinct lines; eight other railroads have two lines each, and the other systems each one line, making a total of thirty-five different lines. With a circle of ten miles radius, there would be intersected twenty-three different lines about evenly distributed. With a five mile radius, there would be fourteen different lines, these including all of the twenty-three lines intersected by the ten mile circle. A two mile circle would intersect but seven lines. This indicates how, through joint ownerships and trackage rights, the railroads have consolidated towards the business centre. Probably in no other railroad centre is there such an extensive system of joint ownerships and trackage.

The three principal belt lines, each of which connects with all railways, are:

The Elgin, Joilet and Eastern Railway, which forms an outer belt from Waukegan through West Chicago, Eola, Joilet and Chicago Heights to Porter, Indiana;

The Indiana Harbour Belt Railroad, which extends from Franklin Park through La Grange, Blue Island, Dolton and Gibson to Indiana Harbour, South Chicago and Pine Junction, forming a middle belt;

The Belt Railway of Chicago, extending south from Cragin Junction to the vicinity of 75th Street thence east to Halsted Street, south-east to Burnside, and east along 95th Street to South Chicago, which forms an inner belt. The Clearing Yard of this inner belt is located to form a connection with the middle belt.

The Baltimore and Ohio Chicago Terminal Railroad, the Chicago River and Indiana Railroad, and the Chicago Junction Railway are also important belt and switching lines.

The Chicago Terminal District is that area whose convex border is the Elgin, Joilet and Eastern Railway with Lake Michigan as its concave border, and extends from Waukegan, Illinois to Porter, Indiana. This covers approximately 1750 square miles and includes some 7726 miles of track operated by steam railroads. This district loads about 4½ per cent. and unloads about 6¼ per cent. of the country's total freight car loadings. There are 4330 industries served by private tracks.

The Average Daily Total Freight Traffic is

Local Traffic		
Inbound	10409 cars	30 per cent.
Outbound	10409 cars	30 ,,
Intra-Terminal ...	9414 cars	27 ,,
Total	30232 cars	87 ,,
Through Traffic ...	4559 cars	13 ,,
Total Freight Traffic	34791 cars	100 ,,

The average daily number of freight trains run in the district is:

Transfer Trains	1813
Inbound Road Trains	269
Outbound Road Trains	267
	2349

The Chicago Switching Zone embraces about 400 square miles; the Outer Zone is bounded approximately by the Indiana Harbour Belt Railroad on the south and west, the Minneapolis, St. Paul and Sault Ste. Marie. Railway, and Chicago and Northwestern Railway at the north-west corner, and the city limits on the north; the Inner Zone boundaries are Irving Park Boulevard on the north, 59th Street on the south and 48th Avenue on the west (thus taking in part of the Belt Railway of Chicago,, but at the north-west corner, these limits are extended to take in Mayfair and Galewood. All shippers located within the Outer Zone pay the same freight rates to or from any given point outside of the Zone, regardless of what railroad each shipper may be located on within the Zone. Ordinarily there is a different rate for cars set on team tracks as between the Inner and Outer Zones.

Through cars that require interchange movement are handled largely by intermediate railroads; counting all clearing deliveries as moving via an intermediate, 78 per cent. move via intermediate railroads, and 22 per cent. are delivered direct. Of the cars interchanged via intermediate railroads, the Elgin,

Joilet and Eastern Railway handles 15 per cent.; the Indiana Harbour Belt Railroad 44 per cent.; the Belt Railway of Chicago 37 per cent.; other railroads 4 per cent.

Some through cars in direct interchange movement are handled at outlying interchange facilities, being set out at those points by the inbound road trains, where they are picked up by the outbound road trains. The majority, however, are handled through break-up yards and train yards. Ninety-three per cent. of the through traffic is handled ten miles or more from the downtown zone of Chicago.

Inbound local cars taken to destination by the same railroads that bring them in average a little over one yarding. Inbound trains deliver to terminal carriers, or to intermediate belt railroads, 26 per cent. of the inbound local loaded cars that require interchange; 74 per cent. of the inbound local loaded interchange traffic is handled through the break-up yards of the inbound carriers.

Outbound trains are made up at freight houses, in downtown yards, in inner yards, in outer yards and at interchange points and frequently pick up additional cars at interchange points or at local destinations.

For handling transfer of L.C.L. freight, the larger railroads maintain transfer houses which, with one exception, are located away from the downtown zone, relieving downtown houses.

WATER CARRIERS AND ROUTES.

GREAT LAKES ROUTES.

The Great Lakes and their connecting channels form a natural highway having a water surface area of over 95,000 square miles, and a shore line of over 8,300 miles. These lakes and channels afford access to a region notable for its natural resources. In point of volume and importance of traffic this lake group has no equal as an inland route for waterbourne commerce.

Between Chicago and Lake Superior points the Falls of St. Mary's River have been overcome by the Soo Locks.

The Inter-lake channels above Buffalo have been improved to depths in excess of 20 feet, and Niagara Falls is overcome by the Welland Canal, 26¾ miles long, with twenty-five lift locks of 255 feet available length, 45 feet width, and 14 feet depth on the sills. A new and somewhat shorter canal is now being built, with seven 800 foot by 80 foot locks having a lift of 46⅓ feet each. The least depth of the canal will be twenty-five feet, but lock sills afford a thirty-foot depth, so that channel deepening to thirty feet will not involve reconstruction.

From Montreal, the head of deep draft ocean navigation, the sailing distance to the westerly end of Lake Superior is about 1340 miles, and to the southerly end of Lake Michigan, about 1200 miles, about 1000 miles being through open lakes in each case. The St. Lawrence River is 1185 miles long, 182 miles of which are above Montreal. Between Lake Ontario and Galop Island, 68 miles, the channel is thirty feet or more in depth, with a minimum width of five hundred feet; thence to Montreal the rapids are overcome by a series of side canals and locks, the forty-six miles of canals having a least bottom width of eighty feet. The locks have widths as low as forty-five feet, depths of fourteen feet and lengths of two hundred and seventy feet.

The Joint Board of Engineers appointed by the Canadian and United States Governments to consider a plan for improvement of the St. Lawrence River has recommended a plan which would reduce the number of miles of restricted channel between Montreal and Lake Ontario to twenty-five, with not more than nine locks and eight bridges and channel depths of twenty-five feet, and with a thirty foot depth over the sills of locks and other fixed obstructions. The locks are proposed to be 800 feet long by 80 feet wide. The restricted channels will vary in width from 220 to 400 feet.

During the winter season the connecting channels of the Great Lakes, and to some extent their harbours, are closed to navigation by ice. Navigation to Montreal is open on an average two hundred and fifteen days a year, usually being suspended from November 25 to April 24. The average length of season on the Erie Canal between 1891 and 1905 was two hundred and sixteen days. The Welland Canal has an average navigation season of two hundred and thirty-seven days, and St. Mary's Falls canals two hundred and twenty-four days. The harbours of the Great Lakes are open somewhat longer, the average for Buffalo being two hundred and forty-eight days, Cleveland two hundred and seventy-one days and Duluth two hundred and thirty-seven days.

The existing channels of the Great Lakes and the upper St. Lawrence River are subject to occasional light fogs in the early morning. These clear up rapidly. Fogs occur in the Gulf and lower river during the navigable season and sometimes last several days. The fogs encountered in the lower St. Lawrence and the Gulf of St. Lawrence, however, are of less frequency and density than those encountered on the regular routes of vessels in the North Atlantic trade.

LAKE VESSELS.

The American lake fleet on May 1, 1925, aggregated about 2,800,000 gross tons, 2,550,000 tons being in steam vessels and the balance in sailing vessels, barges and canal boats. Of all the ships on the Great Lakes of 1000 gross tons register, and over, 501 sailed under the American flag, 201 under the Canadian and 1 under the Norwegian flag.

The average registered tonnage of all vessels was about 1000 gross tons; the average registered tonnage of ships of 1000 gross tons register, and more, was 4000 gross tons. Of this group of 706 larger vessels 626 were bulk freighters, 70 were passenger and package freight steamers and 10 were tankers.

The modern lake bulk freighter has been created in response to a demand for the transportation of an enormous amount of freight over a regular route in a limited navigation season. The typical carrier has its power plant far aft and its quarters in the extreme forward end, the space lying between being unobstructed cargo hold. The entire deck is covered with hatches which are usually spaced twelve feet between centres and register exactly with the pockets in the ore piers.

The largest of these freighters are about 625 feet long and 64 feet in beam with a depth of hull of 33 feet. Headroom requirements are 110 feet. Half the tonnage is in ships 450 feet in length or more while the average length of new vessels built each year has exceeded 550 feet for the past ten years.

The carrying capacity of the largest of the bulk freighters is about 14,000 tons. The average capacity of those built since 1910 is in excess of 10,000 tons.

Most of these vessels require shore equipment for discharging cargoes. A few of the self-unloader type have been built for handling stone and coal, being provided with means of transferring the cargo from the hold to a belt conveyor on a boom which may be swung so as to discharge from 100 to 120 feet back of the face of the wharf. The more modern vessels of this type have discharging capacities in excess of 2000 tons per hour.

Of peculiar local interest at Chicago are the self-loading and self-unloading vessels used in the sand and gravel trade. Several of these operate across the lower end of Lake Michigan bringing sand and gravel to building material yards on the Calumet and Chicago rivers. These vessels discharge their cargo either hydraulically or by conveyor. The larger ones are about 260 feet long with a beam of 43½ feet and a height above water of over 50 feet.

Between Port Colborne and Montreal bulk freighters are smaller than corresponding all-lake carriers, due to channel restrictions, the newer vessels being 261 feet long and about 43 feet wide, with a capacity of 2500 to 3150 tons on a draft of 13.5 feet.

On May 1, 1925, there were 70 steamers of 1000 gross tons register and upwards, aggregating 213,557 tons, in the passenger and package-freight trade on the Great Lakes; 45 were of American registry, the remainder being under the Canadian flag. About half of these vessels are engaged as package freight carriers exclusively, having little or no accommodations for passengers. Some of them occasionally enter the bulk freight trade and are equipped with top as well as side hatches.

These vessels vary in length from 175 feet to 550 feet, from 32 feet to 58 feet in beam, and from 1000 to 7500 gross tons in register.

Package freight is loaded or discharged through side hatches, so ship's rig is not effective for handling this class of cargo.

OCEAN VESSELS.

Maritime traffic is handled by four classes of vessels: Express liners, combination passenger and freight liners, cargo liners and tramps. Express liners have small cargo space and operate on a schedule which leaves little time for taking on and discharging cargo. The largest vessels afloat may be found in this class. But few harbours in the world have been deepened to accommodate them. They draw upwards of 30 feet of water, so that none of the proposed improvements between the Great Lakes and the Atlantic Ocean will permit their entering the Great Lakes.

Next in size are the combination passenger and freight liners. They operate chiefly from Montreal, Quebec, Boston, New York, San Francisco, Seattle and Vancouver. Many of them require depths in excess of 35 feet, though a number operate successfully from Montreal where the limiting draft is 28 feet. Chicago is more likely to attract this type of vessel than any other lake port, and while the number never may be very large, it is wise to plan to accommodate them.

The largest vessels now reaching Montreal are about 14,000 gross tons register, from 550 to 600 feet in length and from 65 to 70 feet in beam. As far as lateral dimensions go these boats are slightly shorter and wider than the larger bulk freight carriers.

The cargo liner and the tramp perform the bulk of the freight carrying business on the ocean. The cargo liner carries freight exclusively and plies regularly over the same routes, while the tramps engage in the same class of business but have no fixed routes or ports of call. These vessels will constitute the majority of arrivals and departures at Chicago's harbour or harbours, as far as ocean vessels are concerned, and for this reason their characteristics are of peculiar interest.

In the coastwise trade vessels would be exclusively of American registry. At present there are about 800 such ships of 1000 tons (and over) register. About 200 of these have a draft of 23 feet or less. The average cargo capacity of these smaller ships is 3750 tons and the average net register tonnage

is 1500 tons. They vary in length from about 200 feet to 350 feet and in beam from 36 feet to 47 feet.

Headroom requirements of ocean vessels which are likely to enter the lakes are over 100 feet.

INLAND WATERWAY ROUTES AND CRAFT.

The Mississippi system of waterways includes as its major features the Mississippi River from its mouth to the head of navigation at St. Paul; the Ohio River and its tributaries such as the Allegheny, Monongahela, Kanawha, Tennesse and Cumberland Rivers, the Missouri River; and the Illinois Waterway and River. From New Orleans to the east and west extend portions of the Intra-coastal Waterway. These streams and canals are in various stages of completion as to improvement and present a multiplicity of controlling dimensions.

Within the next five years it is possible that all of these projects now under construction will be completed, except perhaps the improvement of the Missouri River and the Tennessee River. Approximately 5000 miles of improved rivers anl canals will be open to navigation and have low water depth in excess of six feet. The Mississippi River between the mouth of the Illinois and Cairo may be deepened to nine feet shortly thereafter.

The towboats and barges in use by the Mississippi Service of the Federal Barge Line ar fairly indicative of the types to be expected in the future at Chicago, though it is understood that several years' experience on the part of the Barge Line indicate that the floating stock used is not entirely suited either to the purposes for which used or to the rivers on which propelled.

The towed barges used for general cargo purposes are 230 feet long, 45 feet wide and have hulls 10 feet deep. They are equipped with cargo houses so that they require 20 feet 3 inches of headroom when light, and about 12 feet 9 inches when loaded to a draft of 9 feet. The open top bulk cargo barges are 300 feet long, 48 feet wide, and have hulls 10 feet deep which require about 9 feet of headroom when light. The towboats used are upwards of 175 feet in length and 40 feet in width, and require a headroom in excess of 37½ feet.

The self-propelled barges now in use are 280 feet long and 50 feet wide. They also require more than 37½ feet of headroom.

Boats used for passenger service on the Mississippi River and its tributaries are mostly stern wheel craft, and in the past have operated a combined passenger and package freight service. The largest of these boats are over 450 feet long, 60 feet wide and carry as many as 600 passengers. They require as much as 45 feet of headroom.

Except in isolated cases, smaller barges than those of the Federal Barge Line will likely be found suitable for general use, on account of greater flexibility at terminals and better adaption to channel characteristics. Barges of from 150 to 175 feet in length, 35 to 40 feet in width, and with cargo capacity of not to exceed 1000 tons seem to be about ideal for general use. The size of the towboats used will depend upon the size of tows as limited by channel dimensions and obstructions.

In the Chicago Region limitations imposed by rock sections, bridge draws, and similar obstructions will make it impracticable to operate barge fleets east of Lockport. At Lockport, or at some point west, it will be necessary to break up the tows and bring the barges into Chicago one or two at a time by ordinary harbour tugs of low headroom requirements. River towboats need not be expected in Chicago.

Self-propelled barges operating between Chicago and New Orleans or Pittsburg could be as long as 325 feet and as wide as 65 or 70 feet and there is reason to believe that they will be built to those dimensions whenever traffic is of sufficient volume. If provided with Diesel engine drive these barges in bulk cargo service may be built to clear bridges providing 16½ feet of headroom.

As long as the locks are retained in the lower Illinois River passenger boats will be limited in length to 325 feet. Their width may be 70 feet.

HARBOUR CRAFT.

The term harbour craft includes tugs, lighters, car floats, fire boats, and derricks, pile-drivers, dredges and other construction floating plant.

In general, if there is ample space in a harbour for the complete service of ships there is enough for the ordinary number of auxiliary floating equipment, but where some special condition requires the use of car floats or lighters, for instance, congestion will result will result unless special provision is made for them.

Harbour tugs and lighters are craft of low headroom. They have been built and operated successfully with bridge clearances as low as 15 feet. Steam operated fire boats are high headroom vessels, requiring upwards of 30 feet under bridges. Lateral dimensions vary considerably though it is unusual to find lengths in excess of 100 feet and widths greater than 25 feet.

Car floats are ordinarily deck barges with rails on the decks accommodating from eight to fifteen cars. Those operating on the Chicago River are from 175 to 185 feet long, 34 feet wide and require 22 feet of headroom when loaded with one light car. If these floats were built with ramps at one or both ends the cars could be set down inside the barges and headroom requirements decreased to as low as 14½ feet.

Marine construction equipment, such as dredges, pile drivers and derricks are generally between 100 and 200 feet in length and between 30 and 50 feet in width. These craft seldom draw over 10 feet of water, but they all have high headroom requirements, usually 50 feet or more.

HARBOURS IN THE CHICAGO REGION.

There are seven public and two private harbours in the Chicago Region on Lake Michigan, included within which are some 1600 acres of sheltered water area on the lake front and about 80 miles of improved interior waterways with channel depths of 15 feet or more. These harbours and interior waterways have a total improved water front, including piers and slips, of approximately 72 miles of which about 40 miles are in use to some extent for receiving or shipping goods by water.

The harbours at Racine, Kenosha, Chicago, South Chicago and Michigan City are at the entrances to small streams. As shipping developel, piers were built into the lake, channels were dredged, the streams widened, deepened and straightened, the banks were revetted, and necessary terminal facilities installed. Bridges were thrown across these interior harbours and as congestion of traffic by water and by land increased, breakwaters were constructed to provide lake front anchorage basins, permit construction of lake front terminals, and further shelter the interior harbour approaches.

The harbours at Waukegan, Indiana Harbour, Buffiington and Gary had no streams as interior harbours for their beginnings. Indiana Harbour was built at the entrance to an artificial canal, while the other three have been constructed by reclamation of submerged lands along the lake shore.

The government projects for the improvement of these public harbours and connecting waterways have been practically completed. Operations are confined almost exclusively to maintenance.

There are no tides on Lake Michigan but a succession of years of high precipitation will bring about a high stage and several years of low precipitation will bring about a low stage, these fluctuations affecting each harbour.

Seasonal changes of as great as one foot between high and low stage also take place, resulting from seasonal variation in precipitation. There are also diurnal fluctuations brought about by wind or barometric pressure, or both. The seasonal changes affect the entire lake; the diurnal fluctuations are largely local. These stages are superimposed upon those resulting from the cyclical variations, sometimes so as to increase the range, and at other times so as to decrease it. The lower stages resulting from a combination of these changes in elevation have a decided effect upon the life of marine structures.

These changes in elevation of water surface are small, however, compared to tidal changes at seaports or river fluctuations at river ports, and present no serious difficulties.

While some of the harbours are not used for navigation from about December 14 to April 15, they all probably could be kept open if desired. Solid ice does not form thick enough to prevent a vessel from wedging a way through, though sometimes wind piles up loose ice to such an extent that it is very difficult for a vessel to enter a harbour until after the wind dies down or shifts.

The harbours at Racine, Kenosha and Waukegan are comparatively difficult to maintain as to depth, for there is a littoral drift of sand to the south which forms a bar across the entrance to the last, while in the first two there is a great deal of silt deposited by the tributary streams in time of flood which requires frequent removal. The sand drift prevails all along the western shore of the lake in the Chicago Region, but it is effective only at Waukegan because the entrance between the piers has not been enclosed by the breakwater.

The North Branch of the Chicago River requires considerable maintenance dredging for it is continually being filled in by silt and by deposits of sewage sludge. The upper section of the Calumet River is similarly affected. Annual maintenance dredging is required in the Indiana Harbour Canal as much of the bank is still unrevetted and erosion and sliding are quite extensive. Trail Creek at Michigan City fills in with silt brought down by floods, and there is some littoral sand drift to decrease the depths in the harbour entrance. In no place is the maintenance of depths difficult, however, though the situation at Waukegan requires the most attention.

The exposures of the harbours being different, navigation conditions are not all the same. Those on the south are the most difficult to enter in times of severe storms, Michigan City being particularly bad in this respect.

Wind and visibility conditions at the harbours are approximately the same except for Chicago and South Chicago where the great amount of smoke added to the fogs which prevail generally throughout the region increases the navigation hazard.

The principal obstructions to navigation in the interior harbours and connecting waterways are bridges, though narrow sections, sharp bends and currents also have their effect.

As a general rule where bulk commodities are handled in considerable quantity efficient terminal facilities have been installed by the industries or other agencies directly involved. The most modern type of equipment for discharging ore, coal and stone are to be found at Gary, Indiana Harbour and South Chicago, while the newer elevators on the Calumet River are as efficient as any to be found.

With the exception of the Municipal Pier at Chicago the arrangements for handling general package freight between shore and ship are largely makeshifts. In practically every instance a light shed, not necessarily fireproof, is thrown over a transfer platform, and no provision is made for mehanical handling, either between ship and shed, within the shed itself, or between shed and land carrier.

There is no public dock in the Chicago Region adequately equipped to transfer heavy articles between rail and ship.

HIGHWAYS OF THE CHICAGO REGION.

Until quite recently the planning and construction of new highway systems in the Chicago Region have been characterized by more or less haphazard and uncorrelated efforts on the part of three state highway departments and thirteen county boards.

During the past few years, however, through the agency of the Chicago Regional Planning Association, a marked change has characterized this unhealthy trend of affairs. The first step has been to connect up the loose ends of local highway nets where they ended in the air, so-to-speak, at the state or county boundary lines.

The second step has been in the direction of obtaining wider rights of way. Six counties in the region have adopted rules for the dedication by sub-dividers of rights of way of 100 feet in width along section lines, and 80 feet in width on half section lines. Up to January 1, 1927, 190 miles of connected 80 foot right of way and 210 miles of connected 100 foot right of way had been so provided. Wider road construction of uniform dimensions will be a sequel to this wise policy.

The third objective of this movement for an adequate and correlative highway system for the Chicago Region is the provision of means of circulation between parts outside of the congested districts. Most of the effort in highway building so far has been directed towards providing more roads between the city of Chicago and the outlying districts; as a result the system is largely radial, and circumferential roads are almost non-existent.

Circumferential highways are almost requisite to a comprehensive development of ports and waterways in the Chicago Region. Whether harbour facilities are located at remote parts of the region or not, belt roads are as necessary as radial highways to permit the easy pick up and delivery of trucked freight. The cost of trucking is a function of the time a journey takes, and congestion is more a consumer of time than is distance.

There is nothing in the general highway situation to influence the location of harbour facilities in the Chicago Region. Highways are perhaps the most flexible of the various means of surface communication, and they are especially so in a region devoid of grades and other difficult construction problems. It is safe to assume that the highway situation may be easily adjusted to meet conditions imposed by any scheme of harbour development.

(To be continued).

North-East Coast Ports.

An important stage in the development of Tyne trade with Norway was reached when the Tyne Improvement Commission's new Riverside Quay at Albert Edward Dock was formally opened on June 15th, for it adds appreciably to the facilities for dealing promptly with sea-borne trade. Years ago the Norwegian mail steamer traffic was held by the Commission at the Albert Edward Dock, then it was transferred to Newcastle Quay, and Newcastle Corporation Trade and Commerce Committee lose some £10,000 a year revenue now that the mail steamers are berthed once again near the mouth of the Tyne. The present arrangement is much more convenient, for the trains take passengers from or to the ship's side on to all the main lines. The quay is 1,100 ft. long, and equipped with the most modern appliances for securing rapid turn-round of vessels. It has a single-storey hoist shed 500 ft. long and Customs' offices and a railway platform. Provision has been made for an ultimate depth of water at the quay of 30 ft. at low water ordinary spring tides. There is a hydraulic lift on the quay capable of lifting loaded 20-ton coal wagons and delivering into ships at a height of 65 ft. above high water ordinary spring tides at a speed of 500 tons per hour. The quay is about 2 miles from the mouth of the Tyne, and was designed by Mr. R. F. Hindmarsh, M.Inst.C.E., the Commissioners' Chief Engineer.

Sir William J. Noble, Chairman of the Tyne Commission, formally opened the transit shed and unveiled a bronze tablet recording the completion of the quay. He referred to the importance of the trade between this country and Norway, stating that it had grown since 1914 by 56 per cent. The trade between the Tyne and Norway had increased by 80 per cent. since 1890, when it commenced. Their primary object was to provide increased facilities for that most progressive company, the Bergenske Steamship Co., Ltd., which owned 50 motor and steam vessels with a gross tonnage of 80,000 tons. Their Stella Polaris was, he thought, they would agree, the finest visitor that came to that historic river. They were proud to have that connecting link between the Tyne and Norway.

At the luncheon which followed, the Right Hon. Walter Runciman, M.P., proposed "The Tyne Improvement Commission," and paid a tribute to its work.

Mr. H. P. Everett responding, said that time would amply justify them as it had their predecessors, who had laid down the policy of making the river accessible to any tonnage they could visualise. They had devoted themselves to making this a cheaper port, with reduction of dues—which benefited not only ship owners but everybody.

Replying to "Norway and its Shipping," Staatsraal K. Lehmkuhl (Chairman of the Bergenske Dampskibsselskab (Bergen), said they offered their hearty thanks to the Tyne Improvement Commission for the great work they had undertaken in building that new quay, which, he believed, would be a potent influence in developing the trade of the Tyne, and especially in helping to create a prosperous trade and increasing passenger traffic between Tyneside and Norway. His Excellency the Envoy Extraordinary and Minister Plenipotentiary of Norway (Mr. Paul B. Vogt), had high praise for the quay, which he thought was perfect.

Little more than a fortnight later there was a further development at Albert Edward Dock, when Sir William Noble (on July 3rd), opened a new suite of offices which formed the consummation of a scheme to centralise the work of the Commission's traffic department.

That portion of Newcastle Quay which has been vacated by the Norwegian steamers is being utilised by the Tyne-Tees Shipping Co. for an extension of their trade between the Tyne and Rotterdam, and the Alnwick and Newminster have brought the first cargoes to be discharged at that quay. The occasion was marked by the entertainment by the Chairman of the Tyne-Tees Co. (Sir Arthur M. Sutherland) and his co-directors of a large party of quaysiders on June 25th. Sir Arthur described the growth of the Tyne-Tees Company since 1864, when it had eight vessels varying from 195 to 625 tons each, and a total of 3,524 tons. To-day they had sixteen vessels with a total gross tonnage of 16,200 tons.

It may be more appropriately mentioned that the Tyne-Tees Steam Shipping Co. have also taken a portion of the transit shed at the South Docks, Sunderland.

Lord Joicey, president, at the annual meeting of Newcastle Chamber of Commerce, on July 4th, referred to the depressed state of the heavy industries with which they were concerned on Tyneside. Coal, iron, steel, and shipbuilding seemed little improved. Heavy charges had been imposed on the coal mining industry by politicians through social legislation representing 1s. 6d. to 2s. per ton on coal. This was a great handicap when they had to compete with the foreign producer.

Lord Joicey attended the launch of the ss. "Thistelford" at the yard of Sir James Laing and Sons, at Sunderland, later in the day, and declared: I confess as a shipowner that there is at present no inducement to build ships. The cost of ships, compared with what it was before the war is very much higher. Freights are miserably low at the present time, and they are certainly so bad that there is no inducement for anyone to take their money out of safe investments and put it into ships.

The figures of coal and coke exports submitted to the Tyne Improvement Commission at its last meeting showed an increase for May this year. The total was 1,391,849 tons, an increase of 34,091 tons on 1927, but a decrease of 399,920 tons compared with 1913. The five months shipments totalled 6,459,077 tons, a decrease on 1913 of 1,780,977 tons, or 21.61 per cent. Wear coal shipments for the first four months of the year at 1,917,429 tons, showed an increase of 118,864 tons.

It was with regret that Blyth Harbour Commission received the resignation of their engineer, Mr. John Nivison, owing to his continued ill-health. Mr. Nivison has been with the Commission for 14 years and the last 8 he has filled the post of chief. Mr. Ridley Warham, Chairman of the Blyth Commission, said they were sorry to lose Mr. Nivison, especially as it was on the grounds of ill-health. They desired to place on record their appreciation of the efficient manner in which Mr. Nivison had carried out his duties, and they hoped that by his removal to a milder climate his health might be restored.

Mr. John W. Goldson, M.Inst.C.E., of Tynemouth, has been appointed Engineering Secretary to Hartlepool Port and Harbour Commission in succession to Mr. J. D. Howkins who has retired after 30 years' service. Mr. Goldson has had wide experience in dock, harbour, and other engineering work on the Tyne, Wear, Tees and at Bristol. For some years he was resident partner in Newcastle of the firm of Messrs. J. Mitchell, Moncrieff and Partners.

Automatic Current-Limiting Regulation.

European Stations adopt New Type of Regulator.

Until recent years current-limiting regulation was to be found only occasionally and in comparatively few power stations, though the introduction of a new principle in current-limiting regulation has been eminently successful, and have shown that

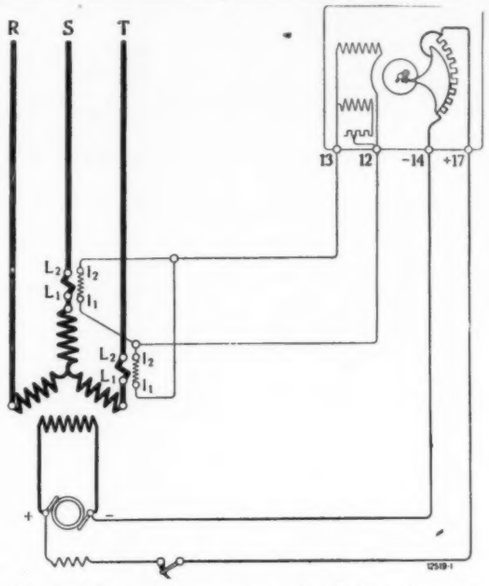


Fig. 1. Diagram of connections of a 3-phase alternator with current limiting regulator.

the doubts originally raised against the system must be withdrawn as the advantages of the method have become more widely recognized.

The object of the current-limiting regulator is to differentiate between temporary and permanent short circuits in contrast to that of the protective arrangements previously in most general use, the duty of which was to isolate the damaged section as rapidly as possible. Temporary disturbances are removed by an automatic rapid decrease in the voltage, and after their disappearance the normal operating pressure is again restored. As before, during continuous disturbances, relays come into operation and isolate the damaged part from the section carrying current. By employing the current-limiting regulator the effect of the disturbance is, however, reduced, and the strains imposed on the oil switch upon interruption of the current considerably diminished.

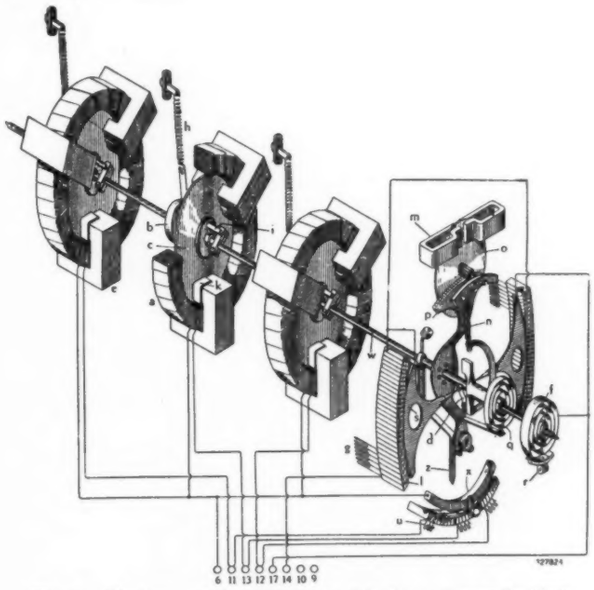


Fig. 2. Diagrammatic arrangement of 3-phase current limiting regulator.

When the voltage regulator operates during a short circuit, the tendency is for the short circuit current to be increased Previously it was tried in various ways to limit or alter the unnecessary operation of the automatic voltage regulator by means of overload relays so that the excitation was not increased but, whenever possible, diminished. Devices of this kind, however, had the disadvantage that they either put the quick acting regulator completely out of action so that after the disturbance it had to be reset by hand, or hunting of the quick acting regulator resulted. The purpose of current-limiting regulation is not only to suspend the action of the quick acting voltage regulator during the disturbance but also to over compensate its effect and so reduce the excitation to such an extent that the alternator current is brought back to the normal value. Then, after the disturbance, normal conditions must be resumed without the parallel operation being affected. This could be obtained only by a device which, as regards speed of regulation and stability not only equalled the quick acting regulator but also, on account of the unstable conditions prevailing during a short circuit, surpassed it.

After a good deal of investigation, one of the leading European electrical concerns, Brown Boveri, produced a current-limiting regulator. It did not differ very much as regards general construction and appearance from the automatic voltage regulator with rolling sectors and silver contact pieces. The motive system (Ferraris type) and the contact sectors, together with the segments upon which they roll, have been retained. In three-phase plants the apparatus was connected as shown in Fig. 1 to two current transformers having their secondary winding in parallel, but with their leads crossed for obtaining the so-called 60-degree coupling.

The way the regulator is connected ensures that it will operate not only with a three-phase short circuit but also with a fault between any two of the phases. The ratio of transformation was so chosen that with full load on the alternator the secondary current is 1A. Consequently the value of the current in the windings of the current-limiting regulator was $1\sqrt{3}=1.73$A. This arrangement enabled a simple circuit to be used and also a simple apparatus. At the present time it is in wide use and has given good service.

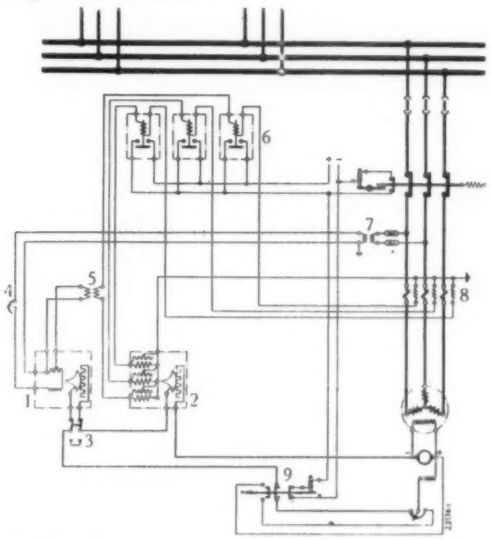


Fig. 3. Diagram of connections of 3-phase alternator with 3-phase current limiting regulator.

1. Voltage regulator.
2. Current-limiting regulator.
3. Change-over switch.
4. Variable resistance.
5. Auxiliary transformer.
6. Overload relay.
7. Potential transformer.
8. Current transformer.
9. Exciter field discharge switch.

It can be seen from Fig. 1 that a short to earth in phase R alone would not affect the current-limiting regulator, as a current transformer is not built into this phase. If the neutral point were definitely earthed, the ground would have the same effect as a short circuit and would thus require that the current-limiting regulator should come into operation. In such circumstances a second current-limiting regulator, which is connected to a current transformer in the third phase, would have to be used.

This solution was adopted as a makeshift, but tests were carried out with a view of designing a current-limiting regulator which would operate on a short circuit occurring in one, two or all three phases. This was by no means easy, particularly as it was regarded from the start as of great importance that the current-limiting regulator should respond with a high degree of accuracy, in order that the apparatus should meet all requirements not only as a safeguard against short circuits, but also as an overload protective device.

Fig. 2 shows the arrangement by which this could be accomplished. From this sketch can be seen both the motive system with the recall device and the resistance system. The power for displacing the segments on the resistances is supplied by the motive system. This comprises three exactly similar driving devices, each of which is connected to one of three phases. Each driving device consists of an aluminium rotating disc C which lies in the field of three iron cores E, between the air gaps of which it rotates. The three iron cores are excited by a coil A which circles concentrically the rotating disc. When the magnets are excited, the arrangement of the short circuiting rings K is such that a magnetic field, lagging with respect to the main flux, is produced. A torque is thus applied to the disc.

By means of a friction coupling the rotating disc C is fixed to a bush which is free to rotate about a hollow spindle. The bush carries a spring drum B to which the main spring H is attached. The spring applies to the coupling a torque which opposes that of the rotating field and is so large that under normal conditions the disc cannot rotate. The spindle is fixed to a frame which carries both the magnet system and the adjusting device for the main spring H. If any excess current produces a torque in the disc sufficient to overcome the opposing torque of the main spring, the shaft W will be rotated so that the driving pin I, which is fixed to the disc, transmits the resulting torque to a corresponding driver on the shaft. Contrary to the designs previously in use, the auxiliary spring F exerts only a comparatively small torque on the shaft and the regulating system, as its purpose is merely to overcome the small friction, and on the disappearance of the excess current to restore the regulating system and shaft W to their original position.

Up to the present time the current-limiting regulator has been made with a very strong static characteristic of 15 to 20 per cent., i.e., equilibrium between the electrical and mechanical torques was obtained in the first operating position with a current strength 15 to 20 per cent. smaller than in the opposite end position. This strong static characteristic, which would be unsuitable in a precision regulator, e.g., a voltage regulator, does not have a disturbing effect on the current-limiting regulator, and is, in fact, used for increasing the selectivity of the overload relay. If the current-limiting regulator is to be used as an overload regulator the high value of the static characteristic is unfavourable for exact operation. Consequently the new three-phase regulator is designed so that by adjusting the auxiliary springs the static characteristic can be reduced.

This also entailed that the recall device, which in the original current-limiting regulator had been discarded as unnecessary, should be re-introduced, as a weak static characteristic would have had an insufficient stabilizing influence.

The recall mechanism comprises the recall spring Q, attached at one end to the shaft W and at the other end to the lever P. This lever operates through a toothed segment and a pinion on the damping disc O, which rotates between the damping magnets M. The purpose of this recall mechanism is not to reduce the speed of regulation but to damp out periodic oscillations.

If, now, an excess current produces a torque on the disc such that the opposing torque of the spring is overcome, the disc is rotated and the shaft turns from the right hand limiting position of the indicator towards the left. At the same time the silver contact sectors S, the steel pivots of which rest in jewelled bearings, are rolled along the contacts, inserting the resistances G into the field of the exciter. This reduces the excitation and causes the excess current to decrease.

Due to the rotation of the shaft the recall spring Q is extended, since its other end is fixed to the return lever which is held back by the damping device. The total torque necessary to overcome the springs is therefore momentarily increased by the recall spring, and a condition of equilibrium between the electrical and mechanical torques is reached before the excess current has quite returned to the normal value. This causes the return movement of the pointer Z and the contact sectors to take place somewhat sooner. In the meantime, due to the rotation of the damping disc, the lever of the recall device is turned somewhat to the left and the excess current is reduced to the normal value. At a certain position of the pointer Z and the contact sectors, a condition of equilibrium occurs between the current strength, the value of the resistance, and the electrical and mechanical torques, so that the rotating mechanism can remain stationary until the disturbance in the system has been removed and the final movement to the original position of rest against the stop at the right hand side can take place.

This flexible recall device, which prematurely curtails the over-regulation and produces the state of equilibrium is the same as that which has been used for some years on the Brown Boveri quick acting voltage regulator.

It has been found convenient to combine the operation of an exciter field discharge switch with the tripping of the generator switch. The switching operations are in these circumstances made according to Fig. 3. By tripping the generator switch the generator is also rendered currentless. Fig. 3 is a diagram of connections of a three-phase alternator with current-limiting regulator, voltage regulator, generator overload time limit relay, and exciter field discharge switch.

STEEL FIRE-FLOAT FOR SUEZ HARBOUR.

His Majesty's Consul General at Alexandria (Mr. C. E. Heathcote Smith, O.B.E.) reports that the Engineering Department of the Egyptian Ports and Lighthouses Administration is inviting tenders for one self-propelled motor fire-float for use in Suez Harbour and Roads. Tenders will be received at Alexandria, up to noon on Friday, 31st August, 1928. Firms in a position to offer a British built vessel can obtain further particulars on application to the Department of Overseas Trade, 35, Old Queen Street, S.W.1 (Ref. AX6553).

Cotton Trade at Venice.

This article is not intended to have the object of showing the progress of the cotton trade between United States of America, and the Port of Venice, but simply to illustrate that Venice does not offer less facilities, and less efficient labour and organisation to such trade than any other leading international harbour.

As a matter of fact, besides the well-known steamship companies connecting Italy to Egypt and India, whence this country is importing large quantities of cotton, in the course of the past few years one of the leading steamship companies of Italy, the "Cosulich Line," has improved her regular service from the Adriatic to the United States of America with frequent sailings from Galveston, New Orleans, Houston, Jacksonville, Charleston, Savannah and Wilmington to Venice and Trieste. Up-to-date motor ships such as the Giulia, the Maria and the Tergestea recently built at the Cantiere Navale Triestino at Monfalcone, to the highest qualification of the leading International Registries, are employed on such service. Such ships have special accommodation to carry cotton, and are fitted with Diesel propelling machinery which offer a certain advantage over ordinary steamers owing to the fact that they can take their bunkers at Gulf ports, thus avoiding to stop at any intermediate port. The great attention paid on board of the ships both at sea and in port to the cargo ensures shippers and receivers of the regular and efficient delivery of the goods.

On the other hand, in October 1927, it has been inaugurated at Venice, the new cotton warehouse having an area of several thousand square metres, built in concrete, on the waterfront, and fitted with appropriate unloading facilities both on the quay and in the interior, and connected by means of railway tracks, on both sides, to the Italian State Railway Station, respectively to the main lines from Venice to Milan, Bologna, Austria and Switzerland, etc. Cotton is unloaded from the ship's bottom by the aid of electric cranes, on small electric cars at the door of the warehouse, when they are regularly weighed by recognised weighers, and then taken into the interior of the warehouse where cotton is sampled, and once more weighed before being taken into the railway cars for immediate transhipment to the factories. Cotton does not lay in Venice more than what is strictly necessary, and by this fact also, shippers and receivers are guaranteed against any risk. In this way, new arrivals of cotton steamers, find always sufficient free space in the warehouses. The short time employed for the discharging and forwarding of the cotton ensures the possibility of reducing charges to the minimum, enabling receivers to find their convenience of directing their cotton via Venice, even when the final destination is not favourably situated.

As it can be seen, the facilities offered now by the Port of Venice to the cotton trade are undoubtedly of great importance both to importers of cotton and to shippers, particularly at the present time when the competition is growing every day, and the question of the total cost of raw materials plays an important part in the cost of textiles, and consequently in the selling of the industrial products.

These advantages have been already recognised by several foreign cotton importers, who in the course of the past few years have increased their purchases through this port, and for instance, during 1927 over 1/7th of the cotton imported from the United States of America has been re-exported to Switzerland and Austria, which fact shows the great interest of these countries in the Port of Venice.

New unloading facilities are under construction on the Deposito Franco Pier in the Harbour of Venice in order to to enable the discharge of parcels directly from the ship's bottoms into the Free Port avoiding national territory. The plant is based on the telefer system. Further, 10 electric cranes are also under erection.

The Maritime Authorities at Trieste have undertaken the construction of the new maritime passengers station on the molo Bersaglieri, and the Italian State Railway Adminstration has taken up the question of the electrification of the railways connecting the port with the hinterland. The main lines connecting Trieste to Vienna via Aurisina, San Pietro del Carso, etc., and Trieste to Munich via Gorizia, Piedicolle, etc., are reaching about 300 metres over the level of the sea on the first 50 km., wherefrom it arises the difficulty of the steam traction which delays the development of trade. It is exactly this reason which has induced the authorities to take up the question of the electrification.

A call made to the new cotton warehouse built by the Società Anonima Docks Cotoni at Genoa has convinced me that the highest degree of efficiency has been reached. The Docks Cotoni pays to the Consorzio Autonomo del Porto 50,000 lire yearly for the rent of the area on which this warehouse has been built, and within 20 years the warehouse will be the property of the Consorzio Autonomo del Porto. In the warehouse 200,000 bales of cotton can be stored at one time.

Unloading and loading charges on various goods at Genoa have been reduced, and the regulations regarding the use of the electric cranes for this purpose have been revised.